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How and How Not to Use the Iso-Degree-Day Chart*

FROM the correspondence that has followed the publication of the Iso-Degree-Day Chart it would appear that a useful instrument has been placed in the hands of the heating fraternity. It must be borne in mind, however, that in the complex civilization of to-day there is practically no such thing as a universal tool, a universal medicine, or a universal anything. Machines are devised, frequently highly complicated and very expensive, to perform only a single manufacturing operation, and no tool or instrument may be used with satisfactory results outside of the function for which it was designed.

Precisely the same argument holds in regard to the Iso-Degree-Day Chart, and it is undoubtedly worth while to excerpt from some of the communications that have been received, and to clarify the scope of the chart, and of the other derived charts in the series.

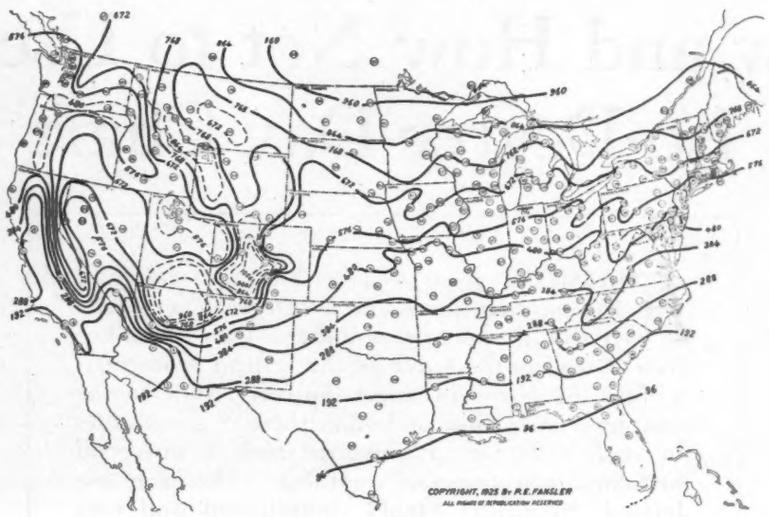
THE quantity "degree-day" is a product of two quantities, time and temperature, the time element being assumed to be a constant, that is to say, a 24-hour period, and the temperature a variable. Thus we may lay out, on a horizontal line, equal spaces representing days, and erect, on each, as ordinates, lines representing the mean temperature for that day. If the extremities of these lines be connected, the area enclosed between the base line and this connecting-line boundary will represent, with a high degree of accuracy, the heating load for the assumed conditions and may be expressed in units of "degree-days."

Now it is obvious that the line connecting these temperature points will not exactly coincide with a curve derived from the record of a recording thermometer which would measure the temperature variations *as they occur* and would not involve a calculation of mean temperature for any period. The integration of such a recorded curve of instantaneous temperatures would, of course, result in a degree-day determination of extreme accuracy, but such procedure is out of the question when it comes to the compilation of data covering a large area or period. It may do very well for a single set of calculations and will undoubtedly produce extreme accuracy, but in this connection one point must be borne in mind. If the degree-days are determined for any location *by taking monthly means*, such results are not comparable to heat

*The Iso-Degree-Day chart appeared in THE HEATING AND VENTILATING MAGAZINE for September, 1925.

loads of other localities, or for the same locality for another period, *where daily averages are used.* It is evident that there will probably be disagreement between the figures obtained by different methods, but it is also obvious that *the results obtained by either method may be used with equal accuracy, provided they are not misused.*

To make the matter, if possible, a little clearer, let us consider a specific case. If we compute, on the basis of monthly mean temperatures, that Jacksonville has 1,000 degree-days; Gadsden, Ala., 3,000; Sandusky, O., 6,000; and Ashland, Wis., 9,000, we may then proceed, as was done in the data sheet supplement for October, to develop a gas-consumption chart *based on these degree-days,* and find that, under assumed conditions of heating value of gas, efficiency of heating unit, and assumed minimum temperature base for calculation for radiation, these cities will require respectively 96, 288, 576, and 864 cu. ft. of gas to provide heat for 1 sq. ft. of steam radiation for the normal local heating season. Furthermore, we may, on the basis of these data, name the gas requirements for other localities.



Suppose, however, that, instead of using *monthly mean temperatures* as a basis of calculation of degree-days, we had either taken *daily mean temperatures,* or the more accurate instantaneous readings of the recording thermometer. The solution is simple: assuming that on either of the new hypothesis it is found that Jacksonville has 1100 degree-days, instead of 1,000, we will undoubtedly find that for each of the cities, the heating load will be represented by a proportionately larger number of degree-days. But, knowing that the *gas requirements for any one of these cities is fixed,* regardless of the actual unit of measurement that may be assigned to the heating load, it becomes necessary only to decrease the amount of gas required "per cubic foot of radiation per degree-day" for Jacksonville, in the ratio of 1000/1100, and for any other city in the ratio of 1000 to the degree-days obtained on the other basis. In other words, the answer is the same as if we change one of two factors that multiplied together equals the total gas consumption. We must change the other in inverse ratio.

Another interesting slant on this problem is brought out by the following paragraph from one letter received.

"The chart deals in averages and takes no account of minimum temperatures or their duration. It, therefore, cannot be used for determining the amount of radiation unless the ratio between the maximum and average demand is known for each zone."

The comment on this statement would seem to be obvious. *The chart is not designed to be used for determining "amount of radiation."* It is designed to enable the computation of the total heat requirements for a heating season *on the assumption that the radiation for the enclosure in question has been correctly figured.*

Again the instrument cannot be used for two purposes. It will fail in its usefulness applied to a case where the radiation is insufficient to maintain the temperature at 70° F. when the outside temperature is *whatever it may happen to be* for the particular space of time under consideration.

One writer expresses it "I want to compliment you on your Iso-Degree-Day Chart. I think that this is the most helpful piece of literature that has been published for the domestic oil burning engineer since the start of the business. It gives, however, only two-thirds of the story and possibly only a half. The velocities of the wind in exposed districts is as much of a factor in heating as the outdoor temperature, and I was wondering why you could not get up a chart giving us the average wind velocity, or, better still, give it to us in day-miles, and from the two you could make a third chart, giving us lines which would be a heating factor based on the degree-day multiplied by the day-miles."

It would seem that a confusion of mind exists in this case inasmuch as the suggestion is made to incorporate, in the element representing *total heating load,* a factor *that should have been incorporated in the calculation for radiation.* The Heating and Piping Contractors' National Association, in its effort to produce a more accurate formula for the calculation of radiation, has effected a very laudable inclusion of wind effect, based on an empirical determination that "1-mile wind velocity is equivalent to 1° drop in temperature" on the average heating load. The tables sponsored by the Heating and Piping Contractors' National Association take this wind velocity and direction into account. It thus becomes self-evident that this factor of wind miles, having been used to determine the *correct* quantity of radiation necessary for a given enclosure, *may not again be used in the determination of degree-days heating load* that is to be carried by that radiation.

Extracts from some of the other letters received are printed herewith as indicative of the interest in and reception of this chart:

From an executive of one of the largest oil burner companies:

"We want to compliment you on the publication of the Iso-Degree-Day Chart, as a graphic and remarkably true method of determining heat requirements."

From a well-known heating engineer, associated with a large gas company:

"I wish to compliment you on your article appearing in the September, 1925, issue of THE HEATING AND VENTILATING MAGAZINE, under the heading 'The Iso-Degree-Day Chart.' I feel certain that it will prove a valuable contribution to our present efforts toward standardization of house-heating costs."

From the superintendent of distribution of an important central heating company:

"With regard to your 'Iso-Degree-Day Chart,' it certainly tells a graphic story that no amount of tabulation could get across, and I am having it photostated for my own use."

From an Executive of a leading coal merchants' association:

"THE HEATING AND VENTILATING MAGAZINE has done a real service in the compilation of the 'Iso-Degree-Day Chart' contained in the current issue of your publication.

"I am going to hold this copy on my desk as it occurs to me that there may be a possibility of practical use of this chart in connection with some of the work we have been planning."

From one of the pioneers and leaders in the industrial gas field:

"I was very much interested in your second article on 'Heating New England with Gas' and I want to repeat the statement which I made in a previous letter, that you had covered the question from a gas man's viewpoint remarkably well. The gas industry is suffering from growing pains in the gas heating game, and as a consequence some of the companies are very much bewildered and it is articles such as these you are publishing which tend to relieve the situation and clear up the befogged conditions confronting many gas company officials.

"In reference to the degree-chart which has been compiled by you, I want to say that in this territory your results check almost identically with the data which we have been using for the past three years. This, in itself, is a source of considerable satisfaction to us."

From the president of one of the oldest and largest manufacturers of oil burners:

"The Iso-Degree-Chart is a very clever piece of work, and is something that is of very great value to us in this company, in computing relative heat requirements in the different parts of the country. We congratulate you on the form in which you have gotten this out, and feel that it is going to be of great value to the industry."

"—— Or Equal"

MANY architects and engineers specify one or more brands of material or equipment by the "trade mark" name, or by the name of the maker, and then follow this with "or equal." There is no such thing as absolute equality in materials or apparatus of two different makes. The use of the words "or equal" only raises a question of doubt and invites subsequent controversy, in which the architect or engineer must exercise his judgment under adverse conditions, the result of which frequently leads to embarrassment and regret.

When these words appear, most contractors invite bids from everybody. Naturally, the prices vary widely according to the respective values. It then becomes necessary to investigate the merits of each article carefully to avoid being victimized if some of the other and cheaper makes are approved. This places quite a responsibility on the architect or engineer and, as a result, the client seldom gets what he thinks he is paying for. It also places the maker of the high-grade material at a disadvantage, because he is forced into competition with a cheaper grade which he would not voluntarily attempt to compete with under other circumstances.

The best that can be said for specifying "or equal" is, as one architect said, "It is a poor attempt on the part of the specification writer to protect a client against monopoly, or else it shows that the architect himself is not sure of exactly what he wants." Often it is used as a means to smooth the ruffled feelings of some of the manufacturers who were not mentioned; again, it is done with the idea that those specified will not be tempted to "boost the price," or leave the impression that the specification writer is "sold out" to one or more of the concerns specified.

The architect or engineer is a specialist who is supposed to have all the technical knowledge required to build and equip a building to meet the requirements for which it is to be built. If a client had the technical knowledge, experience and organization to carry on the project, then he would not call in specialists to perform the operation.

Most clients tell such professional specialists how much money they can afford to put into the building at the very beginning; they know how big it is to be, what they want to do with it, and finally decide whether or not to go ahead with it, depending on the advice they receive from the specialists as to the possibility of the thing being done for the money available. The architect or engineer then and there must make up his mind as to the quality of material and the standard of price values to be used throughout the construction. It is unfair to the contractor, manufacturer, and to the client to specify high grade, high priced material for a job when it has already been settled that medium grade or the cheapest grade of material must be used.

(Continued on Page 67)

17 Years' Experience

Some of the Points Learned from Long Practice—What to d

By H. A. Woodworth, M. E.

IN 1908 at the Presto-Lite Company in Indianapolis, the writer, just out of college, learned "modern welding." He has followed it to the present day. Thousands of feet of underground steam mains have been installed, as shown in Fig. 1, and these pipes have carried pressures as high as 250 lbs. He has installed the following:

3000	ft. of 30-in. pipe
2000	ft. of 24-in. pipe
4000	ft. of 20-in. pipe
3000	ft. of 16-in. pipe
11000	ft. of 14-in. pipe
16000	ft. of 12-in. pipe
20000	ft. of 10-in. pipe
50000	ft. of 8-in. pipe
45000	ft. of 6-in. pipe
120000	ft. of smaller sizes of pipe

He has supervised 135,000 welds on pipe, ranging in size from ½ in. to 30 in. He has studied the composition of the pipe, the type of welding wire, and proper welding conditions. A study and comparison of welded joints as compared with flanged joints proved the welded joint superior.

A study of a method of finding the true neutral flame for welding steel pipe has led the writer to believe that most failures are due to an improper handling of the flame. A study of the spacing of the pipe at proper distances and the shaping of the ends of the pipe, leads to the conclusions that it pays to space the pipe about ⅛ in. apart and to use a 45° chamfer. The chamfer is to be machine-cut. A chamfer made with a torch often oxidizes the metal and makes an inferior weld.

The success of welding steel pipe depends on several things, as steel is difficult to weld. Steel has a high melting point. The rapid solidification and the great change in the structure and physical properties of the metal to the high temperature to which it is subjected during the welding process and the fact that the weld is only a casting, makes welding difficult.

The lower the carbon in the steel, the more severe treatment it will stand, either mechanical or by heat. The high-carbon steel is difficult to weld. The higher the carbon the more brittle will be the metal at this point.

The coarseness of the grain makes the metal less resistent to shock and decreases its ductility. Of course the welding heat affects the base metal of low carbon steel, but the latter being soft and tougher than the former, the metal along the line of the weld would never be affected beyond the safe point.

Steel composition is as near correct as any welding metal on the market. Steel pipe can be had with the same composition as the A. S. M. E. Boiler Code Committee suggested in its preliminary report on rules for welding unfired pressure vessels.

The chemical analysis of steel pipe is as follows:

Carbon	.11 to .16%
Phosphorus not over	.04%
Sulphur	.05%
Manganese	.60%

Pipe of this composition should have the following characteristics:

Tensile strength	45,000 to 57,000 lbs. per sq. in.
Elastic limit	½ of tensile strength
Elongation in 8 in.	22%
Reduction in area	50%

The above analysis and physical characteristics is of pipe furnished in open-hearth steel. Large O.D. pipe is furnished in this metal, while small pipe up to 12 in. in diameter is furnished in Bessemer steel unless otherwise specified.

The carbon content in Bessemer is lower than in the open-hearth steel. The Bessemer has a higher tensile strength, but less ductility which we do not want in base metal for welding.

In selecting pipe for good welding, the sulphur content should be low, as it causes the welds to be porous.

Open-hearth steel is better for welding than Bessemer because the former is softer, tougher, more ductile, and should contain less sulphur and phosphorus.

For 350 lbs. maximum pressure, steam main 250 lbs. maximum, extra-heavy steel or wrought-iron pipe properly welded, tests 45,000 to 57,000 lbs. per square inch. For higher pressures, thicker wall pipe is used.

Welded joints that are subject to severe shocks can be heat treated or a special welding rod used as the case may be. By using a proper welding rod

n Pipe Welding

What to Avoid in Using the Welding Process

Fig. 1. Butt-Weld Test Which Showed Weld to be as Strong as Pipe Itself

Butt-Weld Built Up 10%. Maximum Strength, 51000 lbs. per square inch. Efficiency, 96%.

the same results can be obtained as by heat treatment. For ordinary welding, low carbon rods are the best.

These rods test 65,000 lbs. tensile strength. A welding rod of high ductility should be selected. Due to the thickness of pipe walls, there is no injurious influence from the welding heat along the line of the weld.

Always reinforce your welds by building up the weld 10% to 15%, all of which makes the weld stronger than the pipe.

In preparing pipe for welding, it is necessary to bevel or scarf all pipe above 2 in. in size. Machine scarf is the proper plan, making the bottom of the scarf metal 1/8 in. minimum and run scarf back on the pipe a distance of one and one-half times the thickness of the metal.

EFFICIENCY OF WELDED JOINTS

The writer ran a series of tests in Indianapolis, Indiana, on welded joints. Specimens of steel pipe with 1/2 in. wall and welded together with various types of commercial rods, which had tensile strengths varying from 55,000 lbs. to 65,000 lbs. per square inch, were used. The result of these tests led to the foregoing conclusions. Later tests showed that with different base metals, we must use different welding metal in order to obtain high efficiency in welds.

Test pieces with butt welds were made by employing an ordinary welder picked at random. We advised the kind of weld we wanted and had the welder make a plain butt-weld, using a rod of railroad iron, as illustrated in Fig. 1. The railroad welding rod is considered the best rod for work subject to vibration, such as locomotives, etc. The No. 8 weld was placed in a testing machine and given a tensile test. The weld was built up 10% and made nearly all the way through the pipe test piece. The maximum strength was 51,000 lbs. per square foot and the efficiency was found to be 96%. This test indicates that welds are practically as strong as the pipe itself.

The ductility of welds is not as good as the steel pipe itself hence we ran a test on the deflection, with results as follows:

Bending test span, 10 ft.; 0.1 in. deflection at load of 4050 lbs., 0.5 in. deflection at load of 5300 lbs., and, at maximum load of 6800 lbs. the deflection continued to approximately 90° bend. (Fig. 2.)

The above welds were all made with oxy-acetylene and were plain butt-welds made on 20-in. steel pipe. Two pieces of 20-in. steel pipe were welded together and testing strips 2 in. x 8 in. were cut from the 20-in. pipe. This accounts for the appearance of the strips in the accompanying photograph. Welding rod used in No. 5 test was nickel-steel rod which is a very ductile welding rod.

Other things that affect efficiency of welds are:

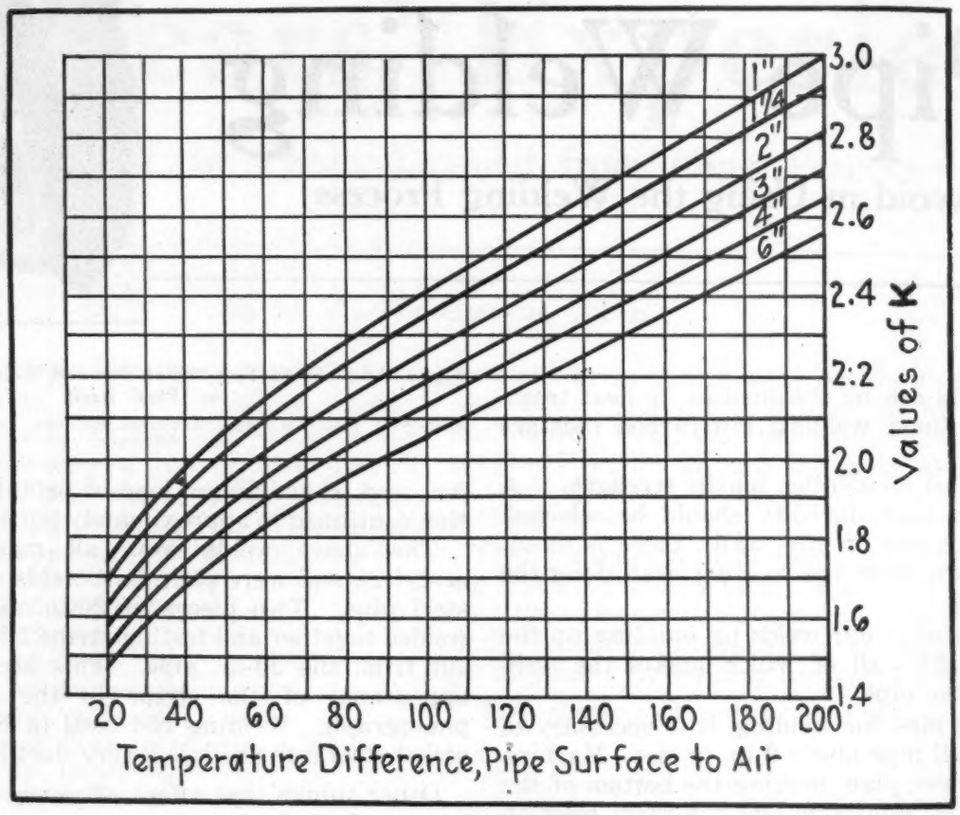
1. Carelessness.
2. Carbonizing flame.
3. Oxidizing flame.
4. Too low a temperature of flame.
5. Improper working regulator or torch.
6. Too large or small a tip.
7. Washing iron oxide into weld.

The result of the Indianapolis tests proved that a weld is stronger than the pipe providing—

1. A skilled careful honest welder is used.
2. Use good pipe.
3. Use good welding material.
4. Have operator weld test pieces and test them in his presence. This makes him careful.
5. Space pipe ends 1/8 in. apart and build up the weld 10% to 15% all around outside of the pipe.
6. Keep high temperature in weld without burning the metal.
7. Use back hand weld.
8. Tack the pipe together in four places and weld one side, then diagrammatically opposite side so as to keep even heat on pipe all the time.
9. Operator must be trained on pipe work first and to weld backwards. In forward weld, flame follows weld; in welding backward the rod follows the flame.
   Welding backward the rod follows the flame and agitating the metal, porosity to some extent is eliminated due to over-heating. This makes a more compact weld and the rod is a very useful tool for holding the metal when doing uphill work.

(*Continued on Page* 66)

Dissipation of Heat by Bare Iron Pipes*



Heat Loss Curves from Bare Iron Pipe, Based Upon Tests at the University of Texas (Fig. 14)

A Comparison of the Work of Various Investigators, with New Curves Based Upon Tests at the University of Texas

By F. E. Giesecke, Ph.D.

Professor of Architectural Engineering and Director, Engineering Experiment Station, University of Texas.

THE earliest investigations of the dissipation of heat by bare iron pipe seem to have been conducted by Professor Rietschel about 1890. The results are published in Rietschel's "Leitfaden fur Luftung und Heizung," fifth edition, Berlin, 1913, and are shown in Fig. 1. It is evident from this graphical representation that Professor Rietschel's results do not possess the regular variation with temperature difference and pipe diameter which we would expect; they are, therefore, not as accurate as they should be for use in the design of gravity-flow heating systems.

PROFESSOR BARKER'S VALUES

Professor Barker evidently noticed the irregular variation in the values published by Professor Rietschel and modified those values so as to secure the degree of co-ordination among them which would be expected. The Rietschel values, as modified by Professor Barker, are published in Barker's "Theory and Practice of Heating and Ventilation," London, 1912, and are shown in Fig. 2. It seems that Professor Barker did not base his modifications on any additional research data but simply on his personal judgment of the co-ordination which he thought should exist. This being the case, we can not consider the Barker modifications of the Rietschel values sufficiently reliable for the design of gravity-flow heating systems until their accuracy shall have been proven by actual tests.

In order to connect the Rietschel and Barker values with more modern data, Fig. 2 also contains the curve for a 5-in. bare iron pipe, as determined by L. B. McMillan at the University of Wisconsin and published in 1915, Transactions, A. S. M. E., Volume 37, p. 941. Since the McMillan tests were made with pipe temperatures ranging from 175° to 575° F. in a room having a temperature of about 80° F., the McMillan curve is not shown for temperature differences smaller than 100° F.

*This article, in slightly different form, is a reproduction of Chapter IV of a thesis, prepared by Professor Giesecke at the University of Illinois, in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Engineering, in the Graduate School of the University of Illinois.

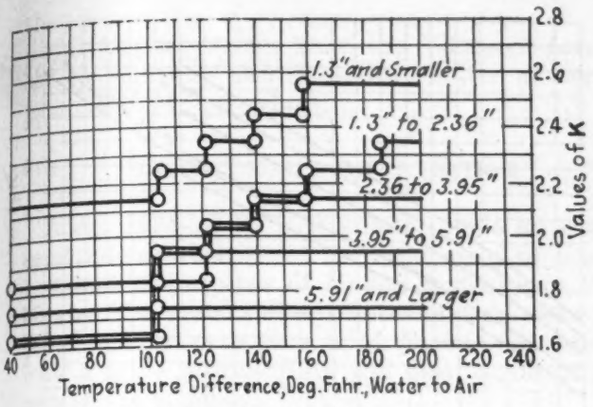


Fig. 1. Rietschel's Tabular Values

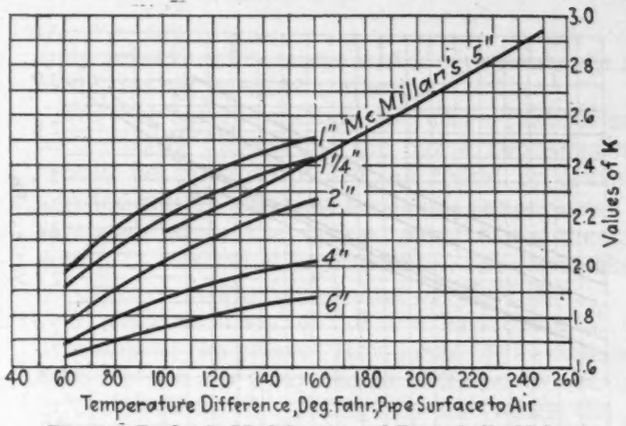


Fig. 2. Barker's Modification of Rietschel's Values

DR. WAMSLER'S VALUES

In 1907-09 F. Wamsler conducted a series of tests in Munich to determine the dissipation of heat by bare pipes. This investigation is described in *Mitteilungen uber Forschungsarbeiten*, Vol. 98, p. 1-45.

Essentially, Mr. Wamsler conducted two series of tests; in the first series he used two concentric spheres arranged so that the outer one absorbed the heat dissipated by the inner one, and so that the air could be exhausted from the space between the two spheres. This enabled him to study the dissipation of heat by radiation only.

In the second series Mr. Wamsler used two concentric pipes arranged so that the outer pipe absorbed the heat dissipated by the inner one, but without provision for exhausting the air from the space between the two pipes.

From the first series Mr. Wamsler found the following coefficients of heat radiation, expressed in kg. cal., m^{-2}, $hour^{-1}$, degree $C.^{-4}$.

Lamp black	4.44
Brass	1.03
Copper	0.79
Wrought iron: dull	4.40
polished	1.33
Zinc	0.97
Cast-iron	4.48
Lime mortar	4.30

Mr. Wamsler also found that for the bodies listed above, and for a range of temperature from 0° to 350° C., the coefficients of heat radiation varied as the fourth power of their absolute temperatures with sufficient accuracy for all calculations applying to engineering practice to justify the use of the formula

$$k_1 = \frac{\left(\frac{T_1}{100}\right)^4 - \left(\frac{T_2}{100}\right)^4}{\frac{1}{C_1} + \frac{1}{C_2} - \frac{1}{C}} \qquad (1)$$

where

k_1 = heat dissipated by radiation in kg. cal., m^{-2}, $hour^{-1}$, deg. $C.^{-4}$.

T_1 = temperature of pipe surface in deg. C. abs.

T_2 = temperature of bodies surrounding the pipe and with which its pipe surfaces exchanges radiant energy in deg. C. abs.

C_1 = radiation factor of pipe surface.

C_2 = radiation factor of surfaces surrounding pipe.

C = radiation factor of black body.

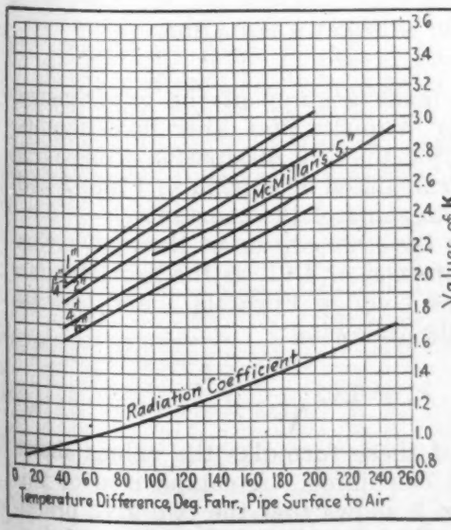


Fig. 3. Wamsler's Calculated Coefficients

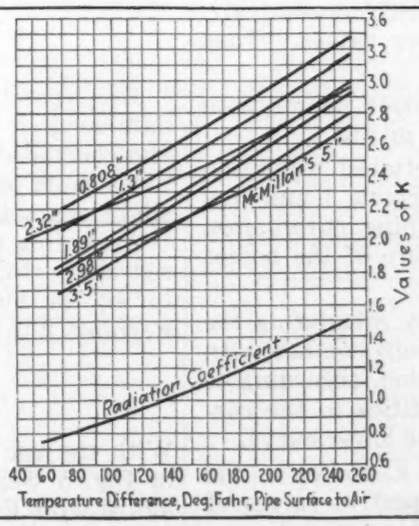


Fig. 4. Wamsler's Experimental Results

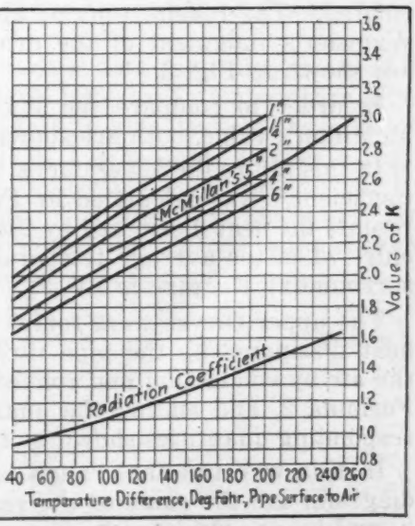


Fig. 5. Dr. Nusselt's Calculated Coefficients

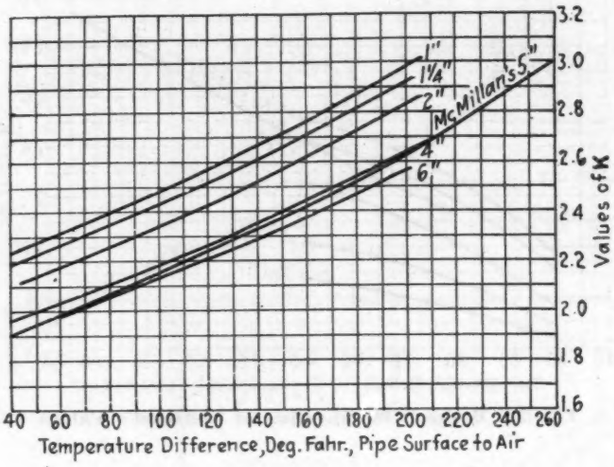


Fig. 6. Heilman's Tabular Values

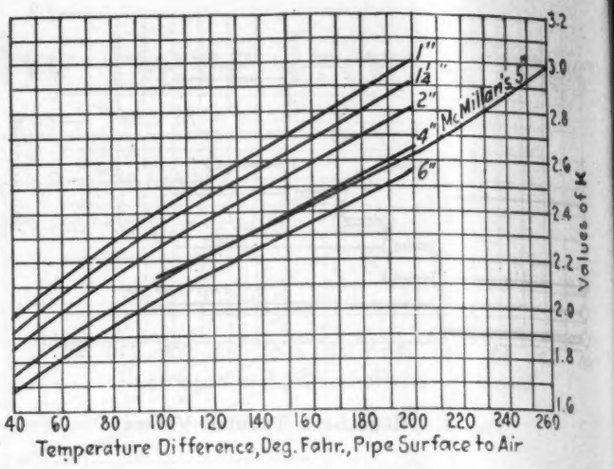


Fig. 7. Proposed Coefficient, Based on Wamsler's, Nusselt's, McMillan's, Heilman's and Original Investigation

From the second series Mr. Wamsler determined the total quantity of heat dissipated by a number of different pipes, among them six wrought-iron pipes varying in size of outside diameter from 0.808 to 3.5 in.

Having determined the total heat dissipated by these pipes, he calculated, by means of Formula 1, the fractional part of the heat which had been dissipated by radiation and subtracted this from the total heat to find the quantity dissipated by contact of the pipe with the surrounding air, partly by air conduction and partly by air convection.

Mr. Wamsler concluded that this portion of the dissipated heat could be determined by the formula

$$k_2 = a\,(t_1 - t_2)^{0.233}\,d^{-0.3} \qquad (2)$$

where k_2 = heat dissipated by air conduction and air convection, in kg. cal. m^{-2}, $hour^{-1}$, deg. C^{-1}.

a = a constant, 0.91 for ordinary wrought-iron pipe.

t_1 = temperature of the pipe surface in deg. C.

t_2 = average temperature of the air surrounding the pipe.

d = outside diameter of the pipe in meters.

By means of Formulas 1 and 2 the total heat dissipated by a bare wrought-iron pipe can be calculated. The results thus obtained represent Mr. Wamsler's judgment of the proper values. They are shown in Fig. 3.

In order to compare the Wamsler values with McMillan's value, both are shown in Fig. 3.

In this figure the lower curve, lettered "radiation coefficient," was calculated by Formula 1 and represents the heat dissipated by the pipe by radiation only, when the average temperature of the bodies surrounding the pipe is 70° F.

The upper curves were found by calculating the heat dissipated by the pipe through contact with the air by conduction and convection, according to Formula 2, and adding the quantities to the corresponding quantities shown by the lower curve.

In this way the final values of k, shown in the diagram, are the sums of the respective values of k_1 and k_2, as calculated by Formulas 1 and 2.

Since the Wamsler values for a 5-in. pipe differ materially from the McMillan values, a detailed study of the Wamsler tests was made. Fig. 4 shows the results of the Wamsler tests as recorded on Pp. 37, 40, and 41, and also the McMillan 5-in. pipe curve. It will be noticed that the curve for the 2.32-in. pipe differs considerably from those for the other five pipes and that it resembles the form of the McMillan curve more than the other five do. The 2.32-in. pipe was tested in January and February of 1908 in connection with the testing of cast-iron and copper pipes of the same outside diameter. The other pipes were tested in April and May of the same year.

The fact that the one curve differs in form from the other five casts a slight doubt upon the reliability of the formula based on these experimental results.

A comparison of Fig. 3 with Fig. 4 shows that the calculated results agree well with the experimental values secured, for the group of five pipes but not so well with the 2.32-in. pipe. The general effect of the values found for this pipe is to raise the value of k_2 for the larger pipes and to bring them into better agreement with the McMillan values.

DR. NUSSELT'S EQUATION

Dr. Nusselt made a study of the experimental data secured by Wamsler and other investigators, and concluded that the heat dissipation of bare iron pipes could be calculated by Formulas 1 and 2 with slight changes in some of the constants.

According to the 1920 edition of Hutte, Dr. Nusselt uses 4.76, instead of 4.61, as the radiation factor of the black body in Formula 1 and changes Formula 2 to the following:

$$k_2 = 1.02\sqrt[4]{\frac{t_1 - t_2}{d}} \qquad (3)$$

With the use of these formulas the values shown in Fig. 5 were calculated. A comparison of this figure with Fig. 3 shows that the two give practically identical values for the 1¼-in. pipe and that, for the larger pipes, the Nusselt formulas give

slightly higher values than the Wamsler formula and consequently secure slightly better agreement with the McMillan values.

MR. HEILMAN'S INVESTIGATION

About 1921-22 R. H. Heilman made an experimental determination of the dissipation of heat by 1, 3, and 10-in. pipes at Mellon Institute in Pittsburgh. The results of his investigation were published in Transactions A. S. M. E., Vol. 44, together with a table representing the dissipation of heat by a series of pipes.

Fig. 6 shows Mr. Heilman's tabular values and the McMillan 5-in. pipe values. A comparison of Fig. 6 with Fig. 5 shows:

A—That the two give practically identical results for the 1¼-in. pipe for a temperature difference of 200° F.

B—That the Heilman values for the larger pipes are higher than the Nusselt values to such a degree that the Heilman values agree well with the McMillan values.

C—That the form of the curves representing the Heilman values is quite different from that of the curves representing the Nusselt values.

The Heilman curves remain concave upward and tend toward a value of 2.00 for k when the temperature difference is zero.

A PROPOSED NEW EQUATION

The Nusselt curves and the Wamsler curves have an inflection point near that value of k which corresponds to temperature difference of 120° and from that point curve downward as the temperature difference decreases.

It is evident that the value k should be zero when the temperature difference is zero. It appears, therefore, that the form of the Nusselt and Wamsler curves is better than that of the Heilman curves.

It is quite evident that the curve which represents the quantity of heat dissipated by radiation is concave upward because the heat so dissipated increases as the fourth power of the temperature difference.

It appears from Professor Rietschel's tests, as shown in Figs. 1 and 2, and from the writer's tests (described below) as shown in Fig. 13, that for low temperature differences, when the larger part of the heat probably is dissipated by air conduction and convection, the curve which represents the heat so dissipated is convex upward.

We may safely conclude, therefore, that for small temperature differences the curve representing k should be convex upward, as found by Rietschel and the writer and that for large temperature differences, when the larger part of the heat, no doubt, is dissipated by radiation, the curve should be concave upward, as found by McMillan.

A general study of all the experimental data available at the present time leads to the conclusion that for the low temperature differences obtaining in the heating of buildings by hot water the true values of the heat dissipation factor for bare iron pipes are somewhere between those given by Nusselt and those given by Heilman.

If we retain the Nusselt modification of Wamsler's formula (Eq. 1) and modify the Wamsler-Nusselt formulas (Eqs. 2 and 3) to the following:

$$k_2 = 0.44\ (t_1 - t_2)^{0.25}\ d^{-0.2} \qquad (4)$$

where k_2 = heat dissipated by air conduction and air convection in B.T.U. ft.$^{-2}$, hour^{-1}, deg. F^{-1}.
t_1 = temperature of iron pipe surface in deg. F.
t_2 = average temperature of air surrounding the pipe in deg. F.
d = outside diameter of pipe in inches,

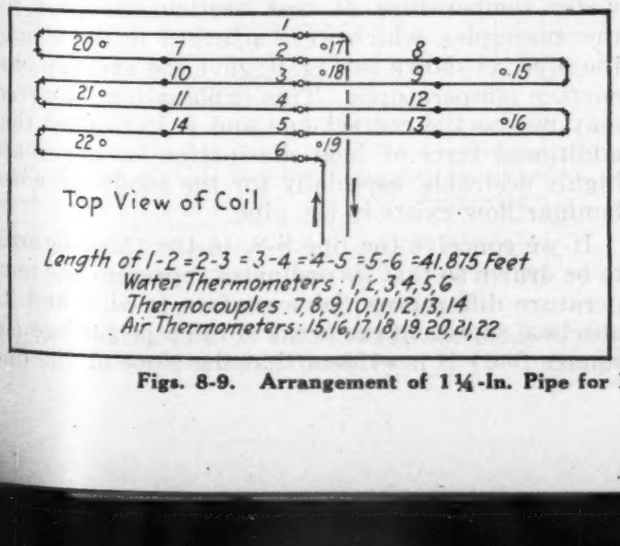
the results will be as shown in Fig. 7 and will agree with the Wamsler values for the 1¼-in. pipe, with the McMillan values for the 5-in. pipe, with the Heilman values, at a temperature difference of 200° F., and will retain the form of the curve found by Wamsler.

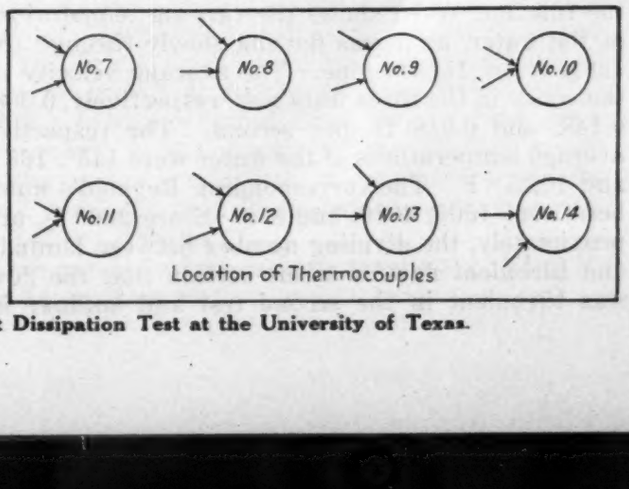
It appears, therefore, that the values of the heat dissipation coefficient for bare iron pipe, shown in Fig. 7, represent, quite accurately, the collective results of all tests available at the present time, particularly when the temperature difference is 100°F. or greater.

It is evident that the value of the heat dissipation coefficient must be zero when the temperature difference is zero and, therefore, that the curves shown in Fig. 7 must, when extended, pass through the origin of coordinates.

Tests at the University of Texas

To secure additional data regarding the heat dissipation coefficient for small temperature differences, such as obtain in gravity-flow water heating systems, the coil of 1¼-in. pipe, shown in Fig. 8, was installed in the testing laboratory of the University of Texas. The pipe was suspended from the ceiling by means of light wires so that the pipe


Top View of Coil
Length of 1-2 = 2-3 = 3-4 = 4-5 = 5-6 = 41.875 Feet
Water Thermometers: 1, 2, 3, 4, 5, 6
Thermocouples. 7, 8, 9, 10, 11, 12, 13, 14
Air Thermometers: 15, 16, 17, 18, 19, 20, 21, 22



Figs. 8-9. Arrangement of 1¼-In. Pipe for Heat Dissipation Test at the University of Texas.

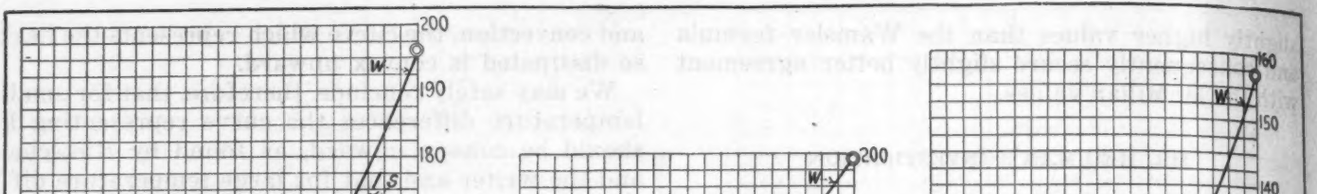


Fig. 10. Test made March 25, 1924. Fig. 11. Test made April 1, 1924. Fig. 12. Test made April 10, 1924.

Heat Dissipation by 1¼-In. Pipe, According to Three Tests

had a uniform grade of about 1 in. in 10 ft., and so that the pipe line occupied a position, approximately horizontal, about 7 ft. above the floor and about 4 ft. below the ceiling. Hot water was allowed to flow through the pipe, out of a vessel in which a constant head was maintained and into a weighing tank, by means of which the velocity of flow was determined.

The temperature of the water was measured by means of mercury thermometers immersed in the stream of water at the six points shown in the figure, and numbered 1, 2, 3, 4, 5, and 6; these points divide the pipe line into five equal sections, each one consisting of 41.875 ft. of pipe and two elbows. The temperature of the pipe surface was measured by means of thermocouples at the eight points shown in Fig. 9. The temperature of the air in the laboratory was measured by means of mercury thermometers at the eight points shown.

The test was conducted, under the direction of the writer, by W. M. Wilson, a graduate student and research fellow at the University of Texas.

RESULTS OF UNIVERSITY OF TEXAS TESTS

The results of three tests conducted, respectively, March 25, April 1, and April 10, 1924, are shown in Figs. 10, 11 and 12. In all three figures the double circles show the water temperatures as measured by the six mercury thermometers, and the full line, W-W, shows the varying temperature of the water, as it was flowing slowly through the 129.4 ft. of 1¼-in. pipe. The average velocity of the water in the three tests was, respectively, 0.068, 0.148, and 0.048 ft. per second. The respective average temperatures of the water were 145°, 165°, and 109.5° F. The corresponding Reynold's numbers were 1600, 4070, and 875. Since 2000 is, approximately, the dividing number between laminar and turbulent flow, it seems certain that the flow was turbulent in the second test and laminar in the third, and that it may have been either turbulent or laminar during the first test.

In all three figures the single circles show the pipe surface temperatures, as measured by means of the eight thermocouples, and the dotted line, S-S, drawn through the circles, shows the average temperature of the surface of the pipe, about 145 ft. long, while hot water was flowing through it and gradually giving up its heat to the surrounding air. It may be seen that in the case of turbulent flow, during the second test, the temperature difference from water to pipe surface was about 2.5 or 3.0° F. and that, for the case of laminar flow, during the third test, the temperature difference was zero.

It is evident that even in the case of laminar flow, there must be a temperature difference, so long as the temperature of the water is higher than that of the surrounding air. A possible explanation of the fact that the test results show no difference in temperature when there must have been one may be that, the flow being laminar, there may have been a considerable temperature gradient across the section of the stream of water, so that the warmer water was in the upper part and the colder in the lower part of the pipe. The mercurial thermometer may, therefore, have shown a temperature somewhat lower than the average water temperature at that section, whereas the thermocouples, which were attached to the side of the pipe, as shown in Fig. 9, gave the average pipe surface temperatures. This explanation, however, may not be the correct one and it is evident that additional tests of heat dissipation by pipes are highly desirable, especially for the condition when laminar flow exists in the pipe.

If we conceive the line S-S, in the three figures, to be drawn so that its ordinates represent the temperature differences (pipe surface to air) and its abscissæ represent the areas of the pipe surface (in square feet) it is evident that the slope of the line

S-S, multiplied by the number of pounds of water flowing through the pipe per hour, will be the number of B.T.U. dissipated per hour and per square foot of pipe surface; and that this number, divided by the corresponding ordinate (in degrees) will be the value of k for that particular temperature difference.

Since the value of k is known to be a function of the temperautre difference (from a large number of experimental determinations) the equation of the line S-S can be easily determined by placing $dy/dx\ 1/y = f(y)$ and finding the value of f by trial. In order to avoid variable end conditions, the two extreme sections of the pipe were neglected and only the three interior sections (from thermometer No. 5 to No. 2, Fig. 9) were considered. The equation for this portion of the line S-S was determined so that the curve represented by the adopted equation differed from the experimental curve, S-S, by less than one-half degree at the extreme and middle points.

Having done this, the slopes of the curves were found as recorded in Figs. 10, 11 and 12, and from these slopes and the known rate of flow (to wit: 157.2, 337.5, and 110.7 lbs. of water per hour) the values of k, shown by the three short curves in Fig. 13, were found. These three sets of k-values do not coincide, but the extreme variation from the mean is only about 3% and the values are probably as accurate as should be expected under the conditions of the test.

The building in which the tests were conducted is one of the University of Texas "shacks"; the walls are built of one layer of vertical boards, ⅞-in. thick; the ceiling is constructed of one layer of boards, ⅞-in. thick, and covered with a layer of composition roofing. About 18 in. above the ceiling is a roof, constructed like the ceiling and functioning like a fly over a tent. The space between the roof and ceiling is open on all sides and permits the circulation of air so that the interior of the building will not be much warmer than the outside air.

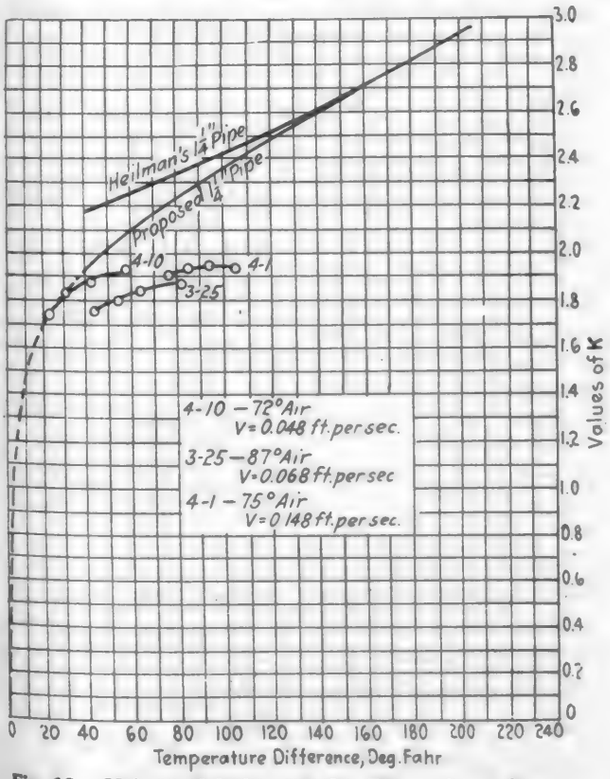


Fig. 13. Values of k for 1¼-In. Pipes, According to University of Texas Tests

The reports of the test show that on April 10, when the highest k-values were obtained, it was "cool and cloudy or raining," on April 1 and March 25 it was "clear and still." Records of outside temperatures are not available at this writing, but since the inside air temperatures were about 15° higher on March 25 than on April 10, it follows that the difference between the two outside air temperatures on the two days must have been more than 15°.

Knowing (see Fig. 3) that of the total heat dissipated about 50% is dissipated by radiation, we may safely assume that in these tests 25% of the total heat dissipated was due to the difference in radiation of the pipe surface, on one hand, and the ceiling and outside wall, on the other. This difference in the conditions under which the tests were conducted may explain or account for a variation of 6% in the resulting k-values, as may be seen from the following approximate calculation.

Assume the temperature of pipe surface as 120° F. and those of the wall and ceiling on the two days, respectively, 70° and 85° F. The two differences of the fourth powers of the absolute temperatures will then be in the proportion of 341 and 248, and one will be about 37% larger than the other. Consequently, the exchange of heat between the pipe and the wall and ceiling by radiation would also be, approximately, 37% more in one case than in the other. One-fourth of this difference would account for an increase of 9% in the k-value found April 10 over that found March 25. This difference would, however, be reduced because on April 10 a 40° temperature difference was from 72° to 112°, whereas on March 25 it was from 87° to 127° and the heat dissipated by radiation on March 25 would therefore be more than that dissipated by radiation on April 10, if the floor and walls and ceiling were all of the same temperature as the air in the room.

If very accurate determinations of the heat dissipation coefficients are to be made, it is evident that the tests must be conducted within a room which is itself inclosed within another room.

Referring again to the three k-value curves of Fig. 13, it is significant that all three agree better, both in position and in direction, with our proposed 1¼-in. pipe curve, shown in Fig. 7, than with the Heilman tabular 1¼-in. pipe curve, shown in Fig. 6, and it seems safe to extend our curve to the origin of coordinates as shown by the dotted line in Fig. 13. Similarly, the lines representing the other pipe sizes in Fig. 7, may be extended to the origin, and the values obtained from these curves used with safety in the design of gravity-flow water heating systems, in which it is necessary to take into account the heat dissipated by the several pipe lines of the system.

This has been done and the results are shown in Fig. 14 on Page 54.

This is the twelfth lesson of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 12—Designs and Inspection Reports, Water Heating Systems

THIS lesson is devoted largely to the preparation of designs, a study of selected existing systems that require remodeling and the preparation of inspection reports thereon. Practically no new work is taken up in this lesson, but rather an application of principles that have been explained in preceding lessons and with which the student should be so familiar that he should have no difficulty in comprehensively understanding and successfully solving the assignments.

Thus the work of this lesson will enable each student to demonstrate to himself conclusively his grasp of the subject to date.

Fig. H-7-1 shows a basement piping layout for a two-pipe up-feed water heating system installed in a three-story residence.

A competent heating engineer was called in to advise the contractor who installed this system as to why it did not function uniformly and how it should be altered so that the residence would be properly heated.

The plant was fired and a test was run by the engineer to determine how circulation was moving throughout the system. He taped and insulated exposed-bulb thermometers on different sections of the mains, branches and to the inlet and outlet pipes to the different radiators. Temperatures were observed while the plant was warming up and after it should have reached a condition to assure steady and even circulation.

Instruction available to subscribers only. The first lesson appeared in November, 1924, but students can enroll at any time. Immediately upon enrollment, Lesson 1 will be sent you, together with the Work Problems pertaining to that lesson. Full directions will be included as to where to send solutions of the Work Problems.

The complete course consists of 30 lessons. They are divided into sections. Lessons 6 to 11 just completed, are devoted to water heating. Ensuing lessons will cover radiators and radiation, gravity steam heating, steam and water boilers and cost estimating.

Price of course complete, with copies of text and problem sheets in convenient loose-leaf form, arranged by colors for different parts, and fully indexed for cross reference, $100.00, payable in equal monthly installments of $10.00. This includes a critical analysis of the Work Problems as solved by each student. An enrollment blank will be sent you upon request, together with full directions for securing all the benefits of the instruction. Students who satisfactorily complete the course will be awarded a Graduation Certificate.

It was observed that water was circulating rapidly to the following radiators:

Southwest bedroom on second floor.
West bathroom on second floor.
West bedroom on third floor.
Living room on first floor.

It was also noted that the water in the returns of the above radiators had a tendency to flow away from the boiler in the main return line and start reversed circulation in branches to other radiators nearest on the main. This condition, however, was only temporary, while the plant was warming up. It seemed to correct itself after the plant had been in operation for one to two hours and circulation at these points was fairly uniform.

Circulation to the following radiators was impaired. The average temperature of the water in them was slightly more than 10° lower than those listed above which were nearer the boiler.

Southeast bedroom on second floor.
Kitchen.
Entrance Hall.
Northeast bedroom on second floor.

There was practically no circulation to and from the following radiators:

East bathroom on second floor.
East bathroom on third floor.
Music room.

In the case of the radiator in the music room, while it was "cold," as compared to those near the

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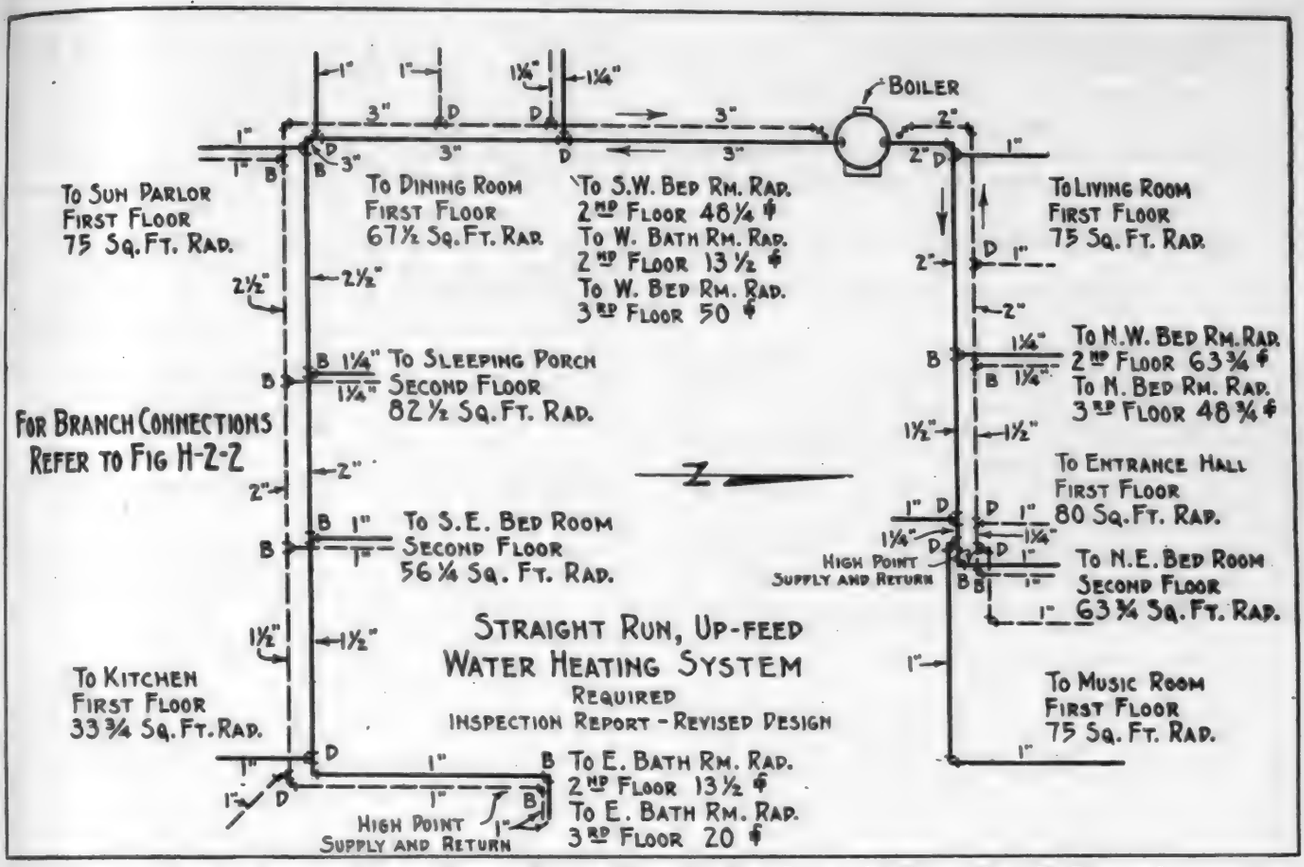


Fig. H-7-1. Basement Piping Plan on Which a Test Has Been Run and a Report Is to Be Prepared
(Used for Problem H-7-1)

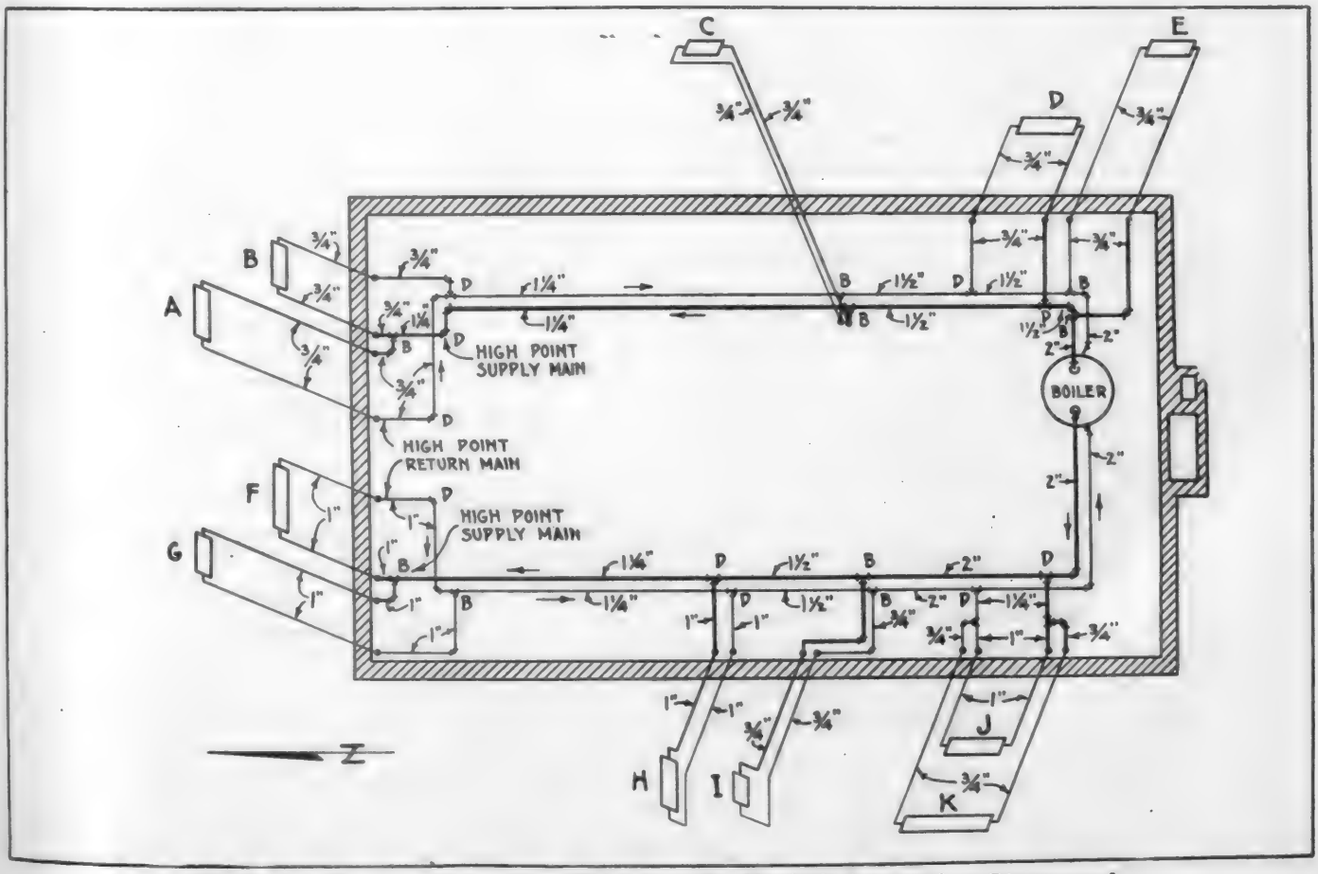


Fig. H-7-2. Basement Piping Plan Which Is to Be Checked, Approved or Disapproved
(Used for Problems H-7-2 and H-7-3)

boiler, yet it was observed that the return connection was warmer than the supply.

All risers to second and third-floor radiators are concealed in partitions, and branch connections to these radiators are made under the floors. In view of these conditions, changes above the basement should be avoided unless absolutely necessary.

Work Problem H-7-1

CHECKING AND APPROVAL

The system shown as Fig. H-7-2 has been prepared for a two-story oblong residence. The sizes of the radiators are stated in Problem H-7-2. The student is to consider that he is assgined to check this design and approve or disapprove it as a straight-run two-pipe up-feed water heating system. If he disapproves it in whole or in part, he is to accompany his disapproval by a report explaining why he has disapproved and what changes he would require before it would receive his approval.

Work Problem H-7-2

It should be noted that the chimney for the system shown in Fig. H-7-2 is located on the south side of the house and that the radiators on the north side are consequently the farthest away from the boiler.

Work Problem H-7-3

(*Figs. H-7-3 and H-7-4 are furnished with Work Problems*)

Fig. H-7-3 shows ten radiators located on two floors, with the boiler in the basement. The student will demonstrate his grasp of the principles covered in preceding lessons by designing six different systems to supply these radiators, observing all directions previously given as to special equipment, piping, size of runs, connections and all points that contribute to correctly designed systems of water heating.

Work Problems H-7-4, H-7-5, H-7-6, H-7-7, H-7-8, and H-7-9

Fig. H-7-4 shows the basement plan of an old residence in which a water heating system is to be installed. There is a cellar under only a part of the dwelling. There is a space of about 2 ft. from the ground to the under side of the first-floor joists over that part marked "unexcavated." The location of radiators is shown and the area of each is given in the following problem.

Work Problem H-7-10

RISER DIAGRAMS

Riser diagrams may often be used to advantage in small, as well as large, work. They are prepared in conjunction with basement and floor plans showing the heating system.

After the size of radiators have been determined and their locations selected, each riser may be given a number as 1, 2, 3, etc., as noted in Fig. H-7-5, and a series of risers drawn on the same sheet, with the radiators that they supply noted by some designating letter or by the area of each. It is better to designate radiators by letter to avoid confusion when several may have the same area. The type of all connections may then be clearly shown, sizes of all pipes noted and the fitter given a blue-print that is easy and convenient to read and follow. In noting type of riser connections, the student should refer to Fig. H-2-4.

The basement plan and a typical floor-plan for a three-story duplex apartment house are shown as Fig. H-7-6 and H-7-7. The sizes of radiators have been determined as stated in the following problem and are located as shown by lettered oblongs in Fig. H-7-6, furnished with Work Problems.

The student is to design a complete water heating system, as specified in the problem, for this apartment, prepare a basement piping plan and a complete riser diagram.

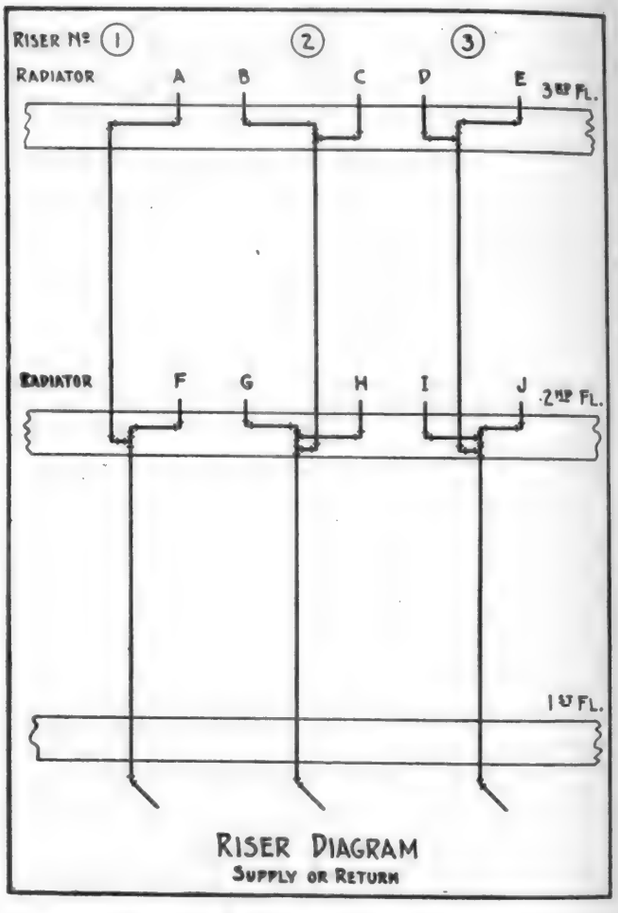


Fig. H-7-5. Typical Riser Diagram
(Used with Problem H-7-11)

Work Problem H-7-11

This lesson concludes the part devoted to water heating systems. Lesson No. 13, to appear next month, will be the first of the section devoted to radiators and radiation and will include methods of estimating radiating surface, comparison of results obtained by different methods and the effect of difference in temperatures within and without the radiator upon the quantity of heat emitted.

Oil-Burning Boilers—Their Design and Characteristics

High Efficiencies Result From the Development of Unconventional Types Suitable Only for Fluid Fuel

This is the second of a series of articles dealing with an acute situation in the domestic heating field, resulting from the difference in the characteristics of coal and oil combustion. Will the boiler manufacturers redesign their present coal-burning boilers to meet the requirements of the modern "on and off" oil burners, or will the oil-burner industry revert to the earlier practice involving continuous, rather than intermittent, combustion?

IN the first article of this series, appearing in THE HEATING AND VENTILATING MAGAZINE for October, an attempt was made to analyze the essential characteristics of operation of a house-heating boiler when burning coal, for which it was designed, and when the newer oil fuel is used. Unfortunately, the deeper we delve into so-called heating science, the more fully we realize how much we lack in the way of real basic data, and how much of the development to date has been predicated upon the cut-and-try method.

In the comparatively new science of electricity, the art of calculation and pre-determination has been brought down to a very fine degree of accuracy. It is a comparatively simple matter to develop, on a piece of paper, the essentials of a 5000-K.W. generator, or 1000-H.P. motor, and predict just what will happen when the machine is built according to specifications, and put into service. If, for instance, such a generator were designed, built and put into operation, and allowed to run for a sufficient time to thoroughly warm up, the rise in temperature in the revolving or in other parts, due to the heat losses occurring in the machine by virtue of its functioning, may be determined almost to the single degree.

On the contrary, take the much older art of heat application and see how much we are at sea in accurately forecasting physical characteristics. To get down to the subject in hand, take a heating boiler, with an oil-burner installed. Fuel is consumed at a definite rate, and for the accomplishment of combustion, a definite amount of air is admitted. Who can say, precisely, what takes place in the combustion chamber? A flame is produced, of almost undeterminable shape, size and surface. Of the precise utilization of the heat developed by combustion, little appears to be known.

We may go back almost a hundred and fifty years to that eminent scientist, John Tyndall with his marvelous power of visualization, and learn all of the elementary laws governing the action of heat. Tyndall's classic researches into the realm of radiant heat culminated in a series of scientific lectures, forming the basis of his later publication, "Heat as a Mode of Motion." The dear old gentleman fairly radiated joy, when, with the crudest of scientific instruments, equipment that would not be tolerated in the high school laboratory of to-day, he brought to his distinguished audiences vivid pictures of radiant heat phenomena. Some of his expressions and phrases are truly remarkable for simplicity of expression and illumination of the subject.

Coming back now, to our oil flame, what have we learned, in the intervening one hundred and fifty years, that will enable us to utilize this rich mine of elementary knowledge to quantitatively determine the heat producing characteristics of the oil flame? We know from Tyndall's researches that radiant heat emanates from hot surfaces. The higher the temperature of the surface, the greater the rate of radiation. Laboratory experiments may give us fairly accurate factors, showing radiation per unit area from various heated surfaces, but how are we to determine the extent of surface of an oil burner flame? If we should accomplish this, how would we then proceed to secure the most efficient utilization of radiation from this flame surface?

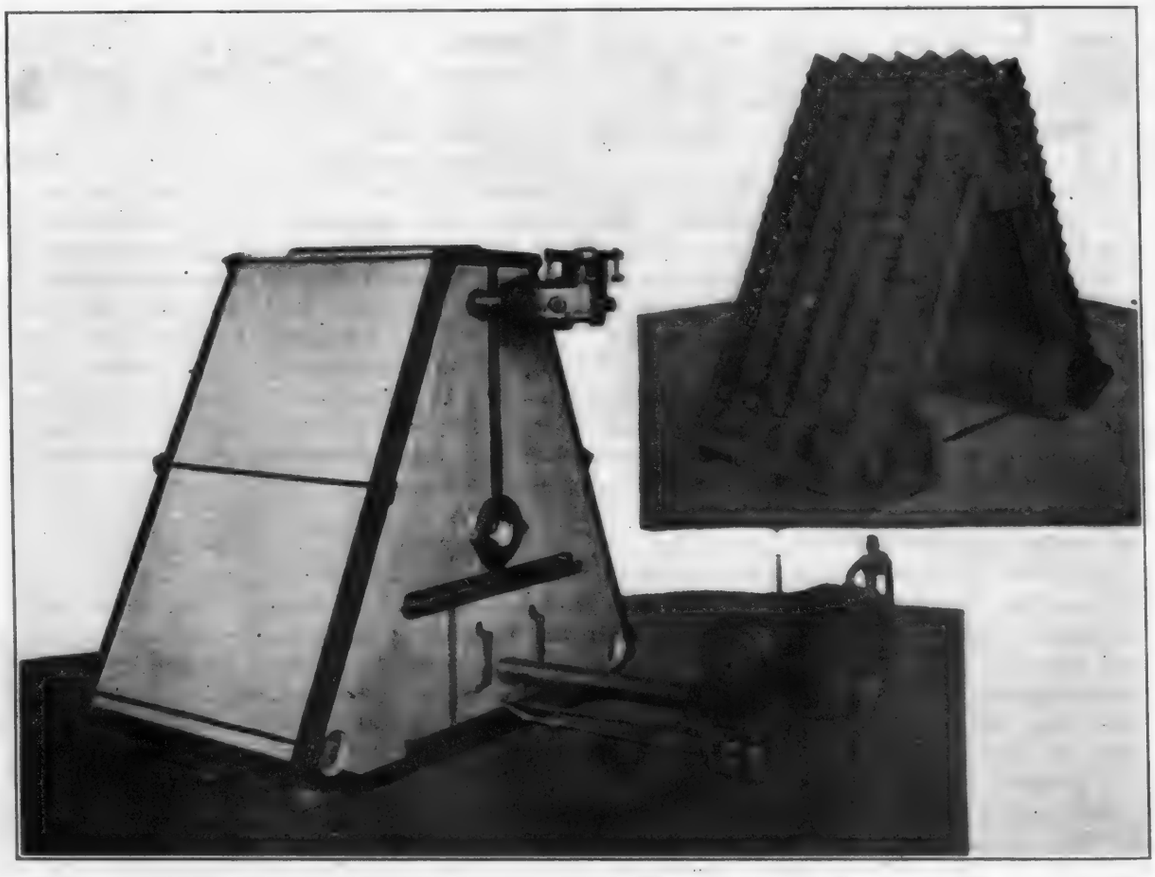
A partial appreciation of the essential difference between the absorption of heat from radiation, and by convection is evident by the usual division of the heating surface of the conventional boiler into "direct" heating surface and "indirect" heating surface, the former being that area within "view" of some part of a radiating body in the combustion chamber, be it an incandescent coal or the flame from an oil-burner. It is axiomatic that a full appreciation of underlying heat laws is a necessary sound foundation upon which may be erected the design of a boiler to most nearly utilize all of the heat that may, in the process of combustion, be liberated in its combustion chamber.

Let us turn now from theory to accomplishment, and see just what boilers are available for installation in American homes, specifically, for use with oil-burners.

AVAILABLE TYPES OF BOILERS DESIGNED TO BURN OIL

It might not be out of place to here interject a statement concerning the use of a third natural fuel for domestic heating, gas. In those cities where manufactured gas is being used for the heating of homes, practically all installations are made of boilers designed only for use with gas-burners. Those interested in the technical side of the question, are firmly convinced, as the result of experiment, that an impossible situation, from an efficiency standpoint, results from a gas-burner installed in a boiler designed for coal. As a consequence, there are available several well-known makes of boilers, designed complete with gas-burners, for use where gas is available. And from the very nature of their design and construction, it is impossible, even as an emergency measure, to use solid fuel with these boilers.

As a parallel to this development of gas-burning boilers, we find a few boilers available to-day designed with the intent that they shall be used only with an oil-burner as a source of heat, or with the possibility of falling back on coal in case of emergency or desire, but with real consideration for the characteristics of the oil flame.



Courtesy of Breese Engineering Company, Chicago, Ill.

Fig. 1. Oil-Burning Boiler Built Up From Standard Vento Sections

One of the most interesting boiler designs falling in this category, is that shown in Fig. 1. This is an oil-burning design out and out, with no provision for, or possibility of, use of grates. The essential feature of this boiler is a series of conventional Vento cast-iron sections, installed on a slant of about 30°, the lower end being raised somewhat from the floor and the combustion chamber being formed under the raised end and between the sides. The smoke-flue is taken from the lower end of the boiler and the burner is introduced into the combustion chamber from one side. The nest of Vento sections is so arranged and baffled that the heat from the burner impinges directly upon the *upper end* of the slanting unit, and the hot gases then traverse the length of the section to the smoke flue at the lower end.

It is thus apparent, that the greatest heat is applied to the upper end of the boiler which is, so far as the water or steam may be concerned, the output end of the boiler. As a consequence, the return water to the boiler enters it immediately adjacent to the smoke pipe so that it is possible to extract a maximum of the heat in the gases, before releasing them to the chimney. If this functioning were reversed it would mean that the flue gases must be higher in temperature by the difference between the temperature of the water outlet and return, and a material sacrifice of efficiency would result.

Another interesting feature of this boiler is the fact that it contains much less water than the conventional boiler, and this results in quick-steaming ability. It is almost evident that this boiler must be fired by an oil-burner capable of operating with a high degree of combustion efficiency, as the pro-

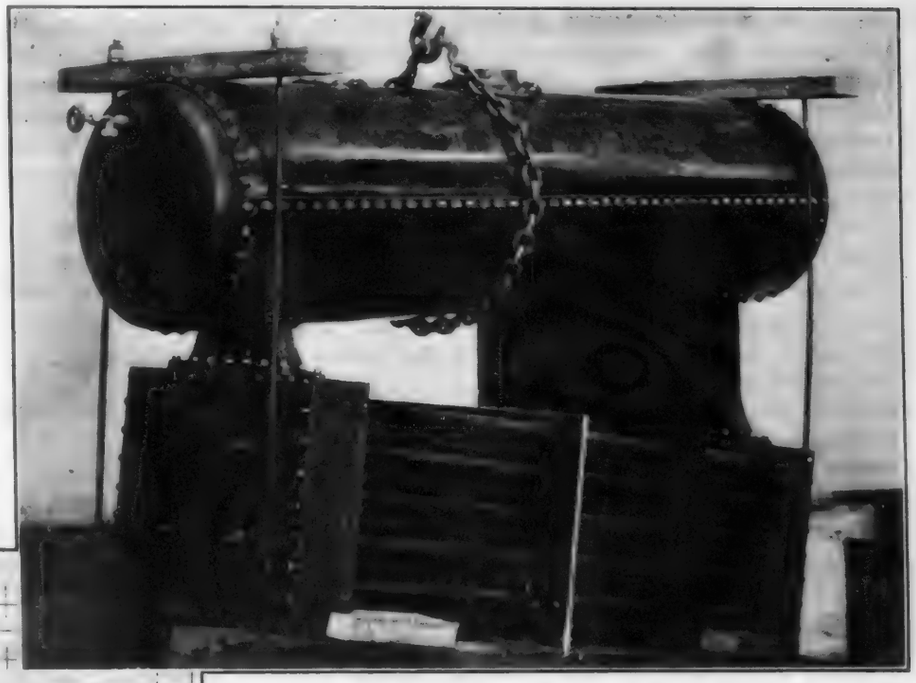
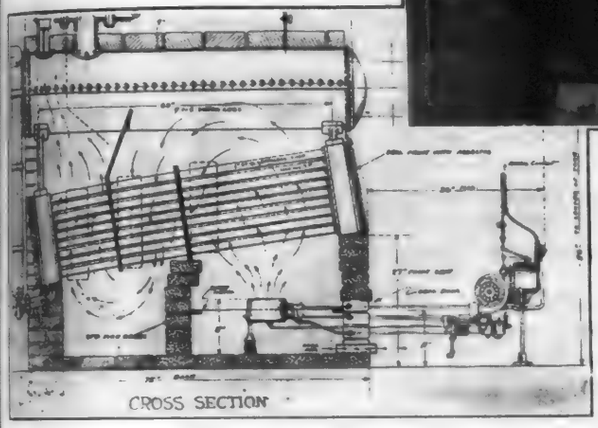


Fig. 2. All-Steel Domestic Oil-Burning Boiler Following Babcock & Wilcox Design



Courtesy Efficient-Heating Boiler Company, Chicago, Ill.

duction of even a small amount of carbon would materially reduce its rating and efficiency.

While it is manifestly unfair to accept single test results as a criterion of working efficiency, yet such figures, where the test is made by competent engineers, certainly predicates possibilities. With this thought in mind, the following data taken from a test run on this boiler, by an organization of industrial engineers, is quoted. The boiler was fired with a well-known domestic oil burner.

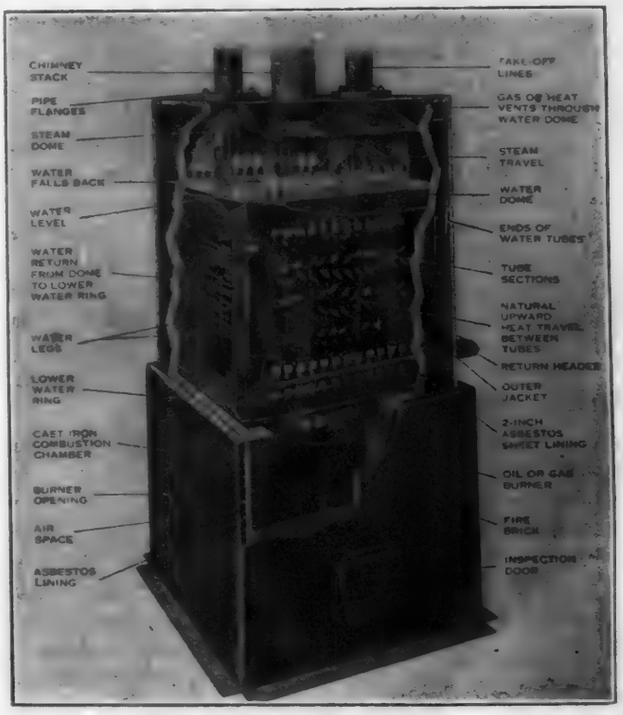
GENERAL DATA

Length of run	8 hours
BTU per lb. of oil	18,542
Av. room temperature	86.7° F.
Av. temp. hot water	151.21° F.
Av. temp. cold water supply	76.1° F.
Av. temp. difference —water	75.11° F.
Av. weight of water per min.	46.8 lbs.
Weight of oil used in 8 hrs.	107.15 lbs.
Average flue temperature	175.10° F.
Average % CO_2	8.4
Average % CO	0.156
Average % O	8.94

HEAT BALANCE	BTU	%
BTU output in heated water	1,704,472	85.7
Stack losses	57,731	2.9
Radiation and unaccounted for	224,572	11.4
	1.986.775	100.0

EFFICIENCY

	BTU Per Hr.
Input Oil	248,346
Output Water	213,059
Efficiency, tap	85.7%



Courtesy Bryan Harvester Company, Peru, Ind.

Fig. 3. Copper Tube Domestic Boiler With Universal Combustion Chamber, Permitting Use of Any Type of Oil-Burner

ALL-STEEL INDUSTRIAL TYPE BOILER DESIGNED FOR DOMESTIC USE

Another interesting development of the past two years, is the boiler shown in Fig. 2. This is a steel water-tube boiler of the Babcock & Wilcox type,

designed particularly for house-heating with an oil-burner. The heat-absorbing elements of this boiler consist of steel tubes, terminating at the ends in headers. The header box consists of a rectangular cast-steel frame with sheet-steel end plates. This unit is installed on an angle, similar to the Vento unit shown in Fig. 1, but the header at each end connects overhead with a horizontal steel cylindrical water or steam-drum.

As in the case of the first boiler mentioned, the heat from the flame first strikes the upper end of the tubes, and by means of two baffle plates, the first of which rests on a fire wall, the hot gases are made to pass over the water tubes three times, thus utilizing their surfaces to the last degree. In a series of tests made at the Union Stock Yards in Chicago, one of these boilers, equipped with a Nokol burner, developed some interesting data, indicating an overall efficiency of furnace and boiler of 77%. The test showed that it was possible to operate the boiler at its rated capacity with a temperature in the stack of only 233° F. This boiler is made in several sizes, having capacities from 850 to 4000 ft. of steam radiation. The boiler is remarkably compact for its capacity, the smaller sizes being so designed as to pass through a standard door.

COPPER-TUBE TYPE BOILER ARRANGED TO BURN OIL

A third boiler, designed primarily for use in conjunction with oil and gas burners, is illustrated in Fig. 3. This boiler, which is designated as a "heat generator," is built up around six cast-iron elements. One, termed the lower water ring, is rectangular in shape, and is tapped for the water return. At its four corners rise water legs, joining the water ring to a water or steam dome, at the top of the generator, this being also rectangular. This portion of the construction gives the form to the unit. Between the water ring and dome elements, 5/8-in. copper water-tubes are nested. Each tube is formed in a zig-zag, and the arrangement of tubes is such that it is possible to replace a damaged one in less than an hour.

A new feature is a cast-iron combustion chamber, lined with sheet asbestos, designed to make the generator adaptable to almost every type of oil burner on the market, regardless of the type of flame produced. The previous practice has been to set the generator on a built-up brick combustion chamber, designed to fit the particular requirements of the installation. With the new combustion chamber, the door has been placed at one side, of such design that any desired opening for burner may be readily provided. An inspection door is placed on an adjacent side, with a self-closing feature, insuring against an open door resulting from a blow-back. The assembled generator is covered with heavy asbestos-cell lagging, with an outer covering of enameled metal, trimmed at the corners with nickeled angles. It is stated that, with a combustion chamber temperature of 1500° F., the generator will absorb heat from the gases to such an extent that a stack temperature of less than 300° F. will be maintained.

Units are made up to 1500 sq. ft. of steam radiation, above which they are set up as multiple units.

This is the second of a series of articles dealing with an important phase of the heating industry, namely, the design and production of heating plants that will secure for American home owners the greatest possible efficiency in the utilization of liquid fuels. Other articles of this series will appear during the Fall and Winter.

Seventeen Years' Experience in Pipe Welding.

(*Continued from Page* 53)

With the precautions stated we employed a welder who followed the suggestions and every weld we tested proved better than 100%, the pipe failing at a tensile strength of 50,000 to 65,000 lbs. per square inch and in no case did a weld fail.

The writer claims welding is an art which, properly executed, will prove in all cases that the butt-weld built up 15% will test stronger than the material welded.

HOW TO START TO WELD

The best practice is to spot-weld the pipe in four to six places sufficiently strong to maintain its

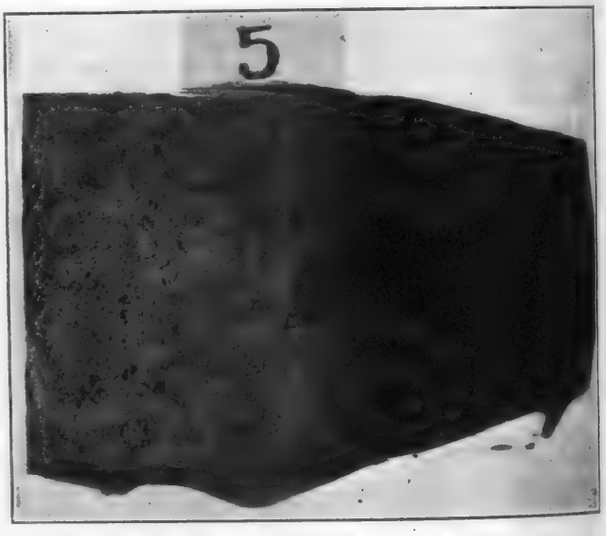


Fig. 2. Bending Test of Welded Steel Pipe
Span. 10 in. Deflection with Load of 53000 lbs., ⅛ in. Bent at Load of 6800 lbs., 90°.

position. The inner bead should be made with care, connecting the inner circumference, following with the second bead or reinforced weld. The thickness of the reinforced weld depends somewhat on the pressure to be carried in the line, but it seems rather inconsistent to build up the weld much thicker than the pipe itself; however, welds should be built up 15% to compensate for any lack of penetration to the full thickness of the metal. It is far better to have the weld protrude beyond the inner surface than to lack complete penetration. On 18 in. pipe and large, the writer has found it good

practice, in case of arc-welding, to weld from the inside of the pipe after the outside weld is finished.

Wherever practical, welding should be done on the top surface of the pipe. On large pipe, rollers may be used and the pipe turned by helpers with chain tongs. When an expansion joint or valve is installed, it is necessary for the welder to work around the pipe as it lies in the trench.

An overhead weld must be made by welding the bottom of the pipe and this may be accomplished successfully when welding electrically by increasing the current to drive the metal in.

COST DATA FOR WELDING

To weld steam mains for pressure of 5 to 125 lbs. low pressure and 125 to 350 lbs. high pressure, the pipe being located in the ditch, the writer has found the following average costs per weld for butt-welded pipe:

WELDING IN TRENCH

The cost includes necessary labor (time of welder, gas, and welding rods)

Size of Steam Pipe In. Diam.	Cost of Welding per Weld Standard Weight Pipe	Extra Strong Pipe
2	$1.00	$1.50
3	1.50	2.00
4	2.00	2.50
6	2.25	3.00
8	2.50	3.50
10	3.00	4.00
12	3.50	4.50
14	4.50	5.50
16	5.50	6.50
18	6.50	7.50
20	7.50	8.60
24	8.00	9.50
30	9.00	11.00

ADVANTAGES OF WELDED JOINTS

The advantages the writer claims for welded joints over other types of joints, include:

1. One welded joint takes the place of two screwed connections.

2. The welded joint properly made and tested should require no maintenance during the life of the pipe, whereas the screwed coupling always presents the possibility of leaks.

3. In laying larger sizes of pipe with screwed joints, difficulty is often experienced in lining up the pipe and there is always danger of getting threads crossed. These difficulties are not encountered in welding.

4. The application of sectional covering gives less trouble and is neater and more compact on welded pipe.

5. Slight discrepancies in grade can be corrected in welding pipe, whereas screwed joints do not afford the opportunity.

6. Flanges can be welded on short pieces of pipe, machined in the shop and tested before they are carted to the job and installed.

7. Tees, crosses, angles, and specials can be made at far less cost of pipe. Long delays in construction can be prevented as you don't have to wait on special fittings.

8. For emergency maintenance work, welding saves one-half the maintenance expense.

The cost of installing underground mains with welded joints is less expensive, more durable, more efficient, and there is no maintenance cost, due to defective welds.

A properly installed welded underground main has a useful minimum life of thirty years.

"——— Or Equal"

(*Continued from Page* 51)

It is unfair to the contractor because it wastes his time getting a lot of useless figures together.

It is unfair to the manufacturer because he has to waste his time making up figures under the deception that his bid will receive favorable consideration.

It is unfair to the client, who gains the impression from reading the specifications that he will obtain the high grade material he is familiar with under the well-known trade names appearing in the specifications. It is only when it is too late to do any good that he fully understands how far the quality and service he anticipated may depart from the standards named in the specifications when those two little words "or equal" are added.

Every competent and experienced architect and engineer has well defined ideas of the respective values of the various makes of similar materials and apparatus. In addition, he knows the respective business methods and the kind of service rendered by the makers. Because he knows these things is one of the most important reasons why he is commissioned to do the work. Hence, knowing as he does which one will give his client the best value for his money, why not specify that particular make and eliminate doubt? Should it be deemed advisable to permit bids to be received on other makes, a clause like the following will cover the situation better than to add "or equal," and will also give a more distinct analysis of the respective values of the various units than could be determined when hidden away in a lump bid on the entire equipment, thus:

"The material (or apparatus) herein specified denotes the standard of quality and capacity desired. Other makes may be quoted on, but bidders must state what will be the difference in price if another make than the one specified is used."

As the quality of the material, the size, the amount required, the capacity, the finish or the efficiency of every piece or part of everything going into a building must be determined some time, either before the contract is let, or during the progress of the work, it is much better to decide all such details beforehand than afterward.—*F. R. Still, vice-president of the American Blower Company, in The American Architect.*

Electric Heating in the Home

FOR those who are bent on using electricity for air and water heating, especially in those such localities as the Pacific Coast States, where the combination exists of a fairly mild climate and low rates for electricity, the following notes by H. E. Sandoval, of the Westinghouse Electric & Mfg. Company, which appeared in *The Architect and Engineer* for September, 1925, will be of more than passing interest.

The use of electricity in house and water heating, states Mr. Sandoval, is increasing rapidly. He classifies electric heating in the home under two headings: (1) air heating and (2) water heating, and discusses them in the order named.

"Air heating by means of large convection electric heaters should not be confused with small radiant heaters which are connected to the ordinary lamp sockets. Such heaters do not heat the rooms, but provide a beam of heat over a small area, and when operating on a lighting rate often prove quite expensive.

"Regardless of what type of heating plant is installed in the home, it is necessary that it be large enough to give adequate heat on the coldest day of the year. These very cold days do not occur often in California, but they prove a real test on the heating system installed. Electric heat is admirably suited to this condition, inasmuch as individual heaters are installed in each room, which are large enough to maintain a comfortable temperature on the coldest day. The heaters are much too large for the ordinary day and are therefore provided with half heat and quarter heat controls. When a room is to be heated, the heaters are turned to full heat for a few minutes until the room is up to the desired temperature and then they are turned to half heat or quarter heat, which will maintain that temperature. A heater is usually placed in the hall or at the foot of the stairway, which serves to take the chill off the entire house and maintain a moderate inside temperature. The other heaters are turned on only when the rooms are occupied.

"The installation cost of an electric heating system compares favorably with that of other systems, especially in new homes. Wires are run to each heating location and all flues, ducts, chimneys, etc., can be eliminated. The saving of space in the basement is sometimes an important item. Heaters usually operate at 220 volts and two No. 12 wires take care of the average heater. The main service should be large enough for the entire load. Ordinarily 1¼-in. conduit with three No. 3 wires and 100 ampere service switch is large enough for the average residence.

"Flush-type air heaters are mounted in the walls, where they take up no room space and are out of the way. Floor-type heaters are also available where heaters cannot be installed in walls, although they are not as desirable. Light, portable heaters can be moved from room to room or to various locations in a room as the furniture is shifted. Ornamental fireplace heaters are installed in mantels and heaters can be ordered in various finishes to match the furnishings.

"Heaters are ordinarily placed near the outside walls of a room, although the air is circulated evenly and their location is not essential.

"There is a definite size heater to meet the heating requirements for each room. Heating formulas are used by electric heating engineers and wiremen to accurately determine these capacities. In locations where the temperature does not drop below 32° F. an allowance of 1½ watts per cubic foot of room air space is sufficient for rough calculations. In colder climates this allowance should be increased proportionately. Any electric heating manufacturer will gladly supply specifications from plans for individual installations.

DATA ON ELECTRIC WATER HEATERS

"Electric water heaters of the circulation type can be attached to the regular water boiler. For household use these boilers come in standard sizes of 18, 24, 30, 40 gal. and larger. The heaters can be turned on and off by hand to heat water as desired, or they can be left on and will maintain a hot water supply day and night. They are equipped with thermostats, which automatically turn the current off when the tank is hot and turn on again when hot water is drawn off. Heaters are made in various sizes. The most popular size (5KW) will heat sufficient water for kitchen use in a few minutes and enough for a bath in from 15 to 30 minutes.

"The cost of maintaining a tank of hot water is greater than if the water is heated as needed on account of the tank radiation losses and the greater use of hot water. Boilers should be thoroughly insulated to keep radiation losses to a minimum.

"A special water heater can be obtained for use with a storage tank which will maintain a supply of 3 gal. of hot water without heating the main tank. This amount of hot water takes care of practically all hot water needs except tub baths and clothes washing and the operating cost is very low.

"One kilowatt-hour of electricity will heat 4 gal. of water approximately 100° F., that is, from 60° to 160° F.

"The power companies in California give a special rate for electric heating and cooking which averages about 2 cents per kilowatt-hour for heating. The climate is mild, which gives a very reasonable operating cost for electric heating. A combination rate for lighting and heating is usually available so that all electricity is measured through one meter.

"All-electric homes which have electric lighting, cooking, water heating, air heating and electric appliances installed, use from $150 to $350 worth of electricity in a year. Lighting, cooking and water heating runs from $100 to $175 per year, which makes the cost of air heating $50 to $175 per year."

Heating and Ventilating the United States Capitol

The Three Methods Successively Adopted to Date for Furnishing Heat and Fresh Air to the House and Senate Wings

By S. Homer Woodbridge

3. The Third and Latest of the Systems Installed in the North and South Wings

(Previous articles: 1. The Original System, March, 1925; 2. The Second System Installed in the House and Senate Wings, April, 1925)

THE second installation, described in a previous paper, served its purpose well for eighteen years except for one gradually developing defect. Where steel pipe connections were made into cast-fittings, particularly at points where the pipe metal was cut away by threading, leaks began to develop, beginning with about the fifteenth year, after which corrosion became more active, until at length renewal or replacement became urgently necessary.

CAST-IRON HEATERS SELECTED TO REPLACE PIPE CONSTRUCTION

In order to prolong the life of any new installation to the utmost profitable limit it appeared advisable to adopt a form of heater employing the least possible of threaded joints, and of cast-iron sectional rather than pipe, construction. Furthermore, because the entire change must be made within an expenditure limited by an available appropriation of moderate proportion, intended to include the costs of other projected work, funds necessary to so reconstruct the fifty or more walled-in heating chambers as to house forms of heaters which might otherwise be chosen as ideal for the new equipment, being insufficient it became necessary to choose a form of cast-iron sectional heater best adapted effectively to occupy available spaces within existing heating chambers.

The Utica pin form of cast-iron convector, a form known to the trade as obsolete, was selected for the reasons, first, that it is made up with flange and gasket joints between sections, without nipples or screw threads, excepting those of holding bolts, entering into the assembling construction; second, that the form when assembled is that of trombone feature, favoring, if not insuring, a positive flow of steam and a progressive expulsion of air, and a corresponding thermal efficiency; and, third, because the sections are made in full and in one-half sizes, and the benches made up of these dual-sized sections in combination could be made to more completely fill the cross sections of the chambers than by the use of any other type of cast-iron convector readily obtainable in the market.

Up to this time this pattern of convector had been made only by the primitive method of hand molding originally employed. The largeness of the order for the Capitol, and of the prospective order for the Washington Cathedral, totalling some 45,000 sq. ft., proved a sufficient incentive to induce the manufacturers to adopt modern methods of fabrication, to reduce costs of production and to rescue the design from the lists of the obsolete and to restore it to the regular listed types of heater sections. To that place it may justly lay claim because of its inherent merits in the simplicity and ease of assembling, in the neatness of assembled construction, in the positiveness of steam or water circulation and filling, and in the progressive expulsion of air, and, lastly, in the large ratio of the extended to the body surface of the sections, as obtained by the number, spacing and length (1-in.) of pins.

HOW HEATERS WERE ASSEMBLED

In practically all cases the new heaters are made up of three super-placed benches, spaced in vertical separation sufficient to provide room below, between and above the benches making up each heater for needed piping and for access to piping and section flange bolts. An iron-plate hinged and framed doorway has been built into one wall of each heating chamber to give access through provided spacings to every part of every bench and all piping making up every heater, a feature for the first time made possible by this third form given to the heaters.

The horizontal cross-sections of the heater chambers vary from 34 in. x 126 in. to 24 in. x 32 in.; the smallest, and the problem in each case was one of filling the areas with the sectional convecting surface, and of reducing to a minimum the spaces to be filled with sheet-metal air stops. The larger sections, of nominal 12 sq. ft. surface each, measure 46 in. in length and 3.67 in. in width, 6 in. deep in body, and 11 in. overall in depth of flanges. The smaller sections are of the same dimensions except for length, 24 in., nominal heating surface 6 sq. ft. In most cases the benches are made up of

three divisions, two divisions of 12 sq. ft. sections and one division of 6 sq. ft. sections, the latter frequently placed with horizontal axes at right angles with those of the larger sections.

COURSE OF STEAM THROUGH BENCHES

In every instance steam enters benches at one point only, passing from the first entered division to the second, and from the second to the third, where the bench is made up in three divisions, by pipe connections at top between the divisions, the steam passing from the remotest end of the last section of division 1 to the first section of division 2, and from the last section of division 2 to the first of division 3.

To prevent the passing of steam from division to division of benches through their condensate piping, the condensate from divisions 3 and 2 is made to drain through a water-sealed U trap of 1 ft. length, ¾ in. pipe, to the return line connecting all divisions, and into which division one drains direct without trap. The function of the trap is to aid, if not insure, the flow of steam through the pipe connections provided for that purpose, and to prevent the clicking, snapping and otherwise possible water-hammering due to a counter flow of steam and water within condensate piping. The results, as to steam flow and quietness of action and performance of benches, have without exception met expectations.

PROVISION FOR TEMPERATURE REGULATION

As thus far described, the benches are without means for controlling the temperature of air passed through them except as steam may be admitted to one, two or three of the benches making up each heater. To provide for temperature regulation, the method of fixed orifice and variable steam pressure in mains and distributing piping has been adopted. From observations and computations previously made, it was found that under conditions of average air-flow rate, one bench steam-filled at atmospheric pressure may be assumed to raise the temperature of air from an initial of 55° to a final of 115°, a temperature considered sufficient, with air-ways and room and corridor registers open, to properly warm rooms and corridors in ordinary 15° F. weather.

For weathers ranging from 15° to 70° the used benches may be correspondingly steam and air-filled, the sections of the benches steam-filled reducing, and the sections air-filled increasing with the rise of outside temperature. For weather conditions under 15°, or in case of high wind, cloudiness or storm, more than one bench in each heater may be steam-fed.

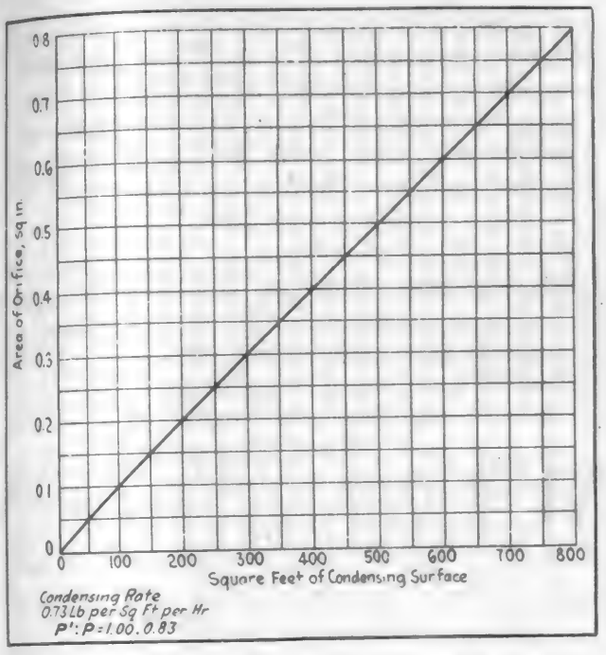
CAREFUL REGULATION OF STEAM PRESSURE NECESSARY

To effect steam-pressure regulation within the distributing and run-out piping within the wide range required for producing regulated steam flow through fixed orifices, it became necessary to so reconstruct the entire piping system as to insure steam distribution to, and equality of steam pressure at, every point at which heaters are located, and also to proportion the piping for such distribution under pressures varying from 1 oz. to 4 lbs., those pressures being equivalent to a corresponding ratio of steam flow through orifices against atmospheric pressure of from 1 to 4.4, and those ratios of steam flow corresponding to a range of final air temperatures of from 77° to 115°. With renewed piping, proportioned to meet computation requirements, and with all heaters in severe-weather operation, the initial pressure at the reducing valve has been found to differ hardly appreciably from pressures at the extremities of steam pipe runs. Pressure is reduced through a lever-type of reducing valve from 30 lbs. on the mains from the power house plant (after a preliminary pressure reduction from 200 lbs. to 90 lbs. at the plant) to that needed for Capitol heating work.

By the means just described temperature regulation is made more controllable, through a wider range and to a closer degree and by a simpler method, than was formerly possible by either method provided in connection with the original, or with the second, installation, previously described. Because of gratifying experience on the part of the engineer of the Senate Wing, the complete pneumatic control of heater and bench steam valves has been retained and perfected in that wing. By the throw of a switch in his office steam can be turned at will into the bottom, the middle or the top bench of every heater in the wing, or into any two benches of those heaters, or into all three benches of all the heaters. Furthermore, when for any reason desired temporary or permanent superheating is called for in any section or room of this wing all three benches of any heater may, by a single switch throwing, be steam-filled. Because of preference on the part House Wing personnel for hand operation of valves, the pneumatic features of valve control have not as yet been generally applied to that section of the building.

Because of the length of the major part of the benches and heaters, and the number of flue openings ranged along these lengths at the tops of heating chambers, if steam be admitted at one end of benches in weather making their steam-filling unnecessary, then air passing through the steam-filled ends would be warmed, while air passing through the steam-void ends of the same benches would be unwarmed. Consequently, air passing to some rooms would be warmed and that to other rooms unwarmed. To overcome the possibilities, if not probabilities, that heated and unheated air cannot be counted on to thoroughly mix in the considerable spaces above the benches and below the flue openings in the heating chambers, all heaters are so steam-connected that the middle bench of each heater takes steam at the end opposite that at which the other two benches are steam-fed. That arrangement insures heating of air at both ends of every heater, and makes necessary but

one-half that steam-flow rate to each bench needed if only one bench were in action. The method of divided steam-feeding described calls for a lowering of steam pressure in distributing mains and



Relation of Orifice Area to Condensing Surface

runouts to approximately one-fourth that needed when steam supply to each heater is through a single orifice into one bench.

HOW AREAS OF ORIFICES WERE FIGURED

The method employed for computing the areas of orifices in this instance did not make use of tables heretofore printed in the colums of this journal, for the reason that the form of orifice used is not that of a cylindrical bore through a plate, or a plug, to which those tables apply, but through a ⅜-in. plate with 45° flared approach upon the feed side. Napier's formula, with modifications noted below, for absolute pressures upon the low side above 58% of absolute pressure on the higher side, was used.

If P_1 represents the higher pressure (absolute), and P the lower pressure (absolute), and W the rate of steam flow in pounds per hour, and A the area of orifice in square inches, and C the modifying ratio correction, then the modified formula for all differences of pressure between P_1 and P, when the ratio of P to P_1 is greater than 0.58, becomes

$$W = P_1 \times A \times 51.4 \times C.$$

The correction curve for C is one experimentally determined. Manifestly, when pressures are equal on both sides of an orifice the only movement is that of molecular diffusion, mass flow being then nil. The ratio of actual flow through an ideal orifice, namely, that corresponding to the form of "contracted vein," to that of flow rate through the same orifice when the ratio of P to P_1 is lower than 0.58, is shown by the accompanying graphical table.

Computations for determining orifice areas are reduced to the utmost simplicity by the use of the graphical table, derived in the following manner: Let it be arbitrarily determined that the area of orifices shall be such that the benches to which steam is supplied shall be steam-filled at atmospheric pressure when the steam pressure P_1 upon the supply side shall be of 3 lbs. gauge, or 17.7 lbs. absolute. The ratio of P to P_1 is then 14.7 to 17.7, or 83%. From the curve it appears that under such a combination of related pressures the percentage of flow is 80.5 of that given by Napier's rule when the ratio of P to P_1 falls to or below 58%.

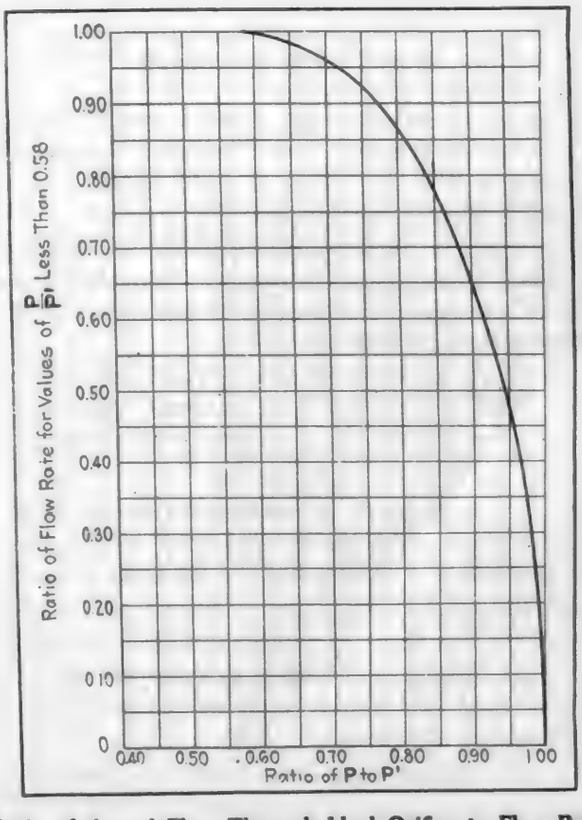
From the equation $W = P_1 \times A \times 51.4 \times 0.805$

$$A = \frac{W}{P_1 \times 41.38} = \frac{W}{17.7 \times 41.38} = \frac{W}{732.4}$$

If operating conditions as to temperature and rate of air flow are such that the benches, when steam filled at 212°, condense steam at the rate of 0.73 lbs. of steam per square foot per hour, then the area of orifice for a bench, made up, for instance, of twenty 12 sq. ft. sections, and ten 6 sq. ft. sections becomes

$$\frac{219}{732.4} = 0.3 \text{ sq. in., diameter } 0.618 \text{ in.}$$

Once conditions of steam and air flow have been established for any system, the computations for orifice areas may be greatly facilitated by reference to a graphical table such as is applicable to the situation above cited, and by further reference to another graphical table converting areas to corresponding diameters in whatever unit may be chosen.



Ratio of Actual Flow Through Ideal Orifice to Flow Rate Through Same Orifice When P/P_1 Is Less Than 0.58

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IT IS a singular fact that almost all of the larger industries can show more complete statistics regarding their activities than can the heating industry. Anyone who has attempted to compile data on the number of heating boilers manufactured, or radiators, or valves, or fittings, knows how quickly he exhausts the available sources of information.

It so happens, however, that a great improvement has been made in recent years in the gathering of trade statistics. This is due, largely, to the initiative of the Department of Commerce.

In the gathering and dissemination of statistical material by trade associations, Mr. McCullough of the Chamber of Commerce of the United States, emphasizes the following points:

"1. That as a beginning, trade associations, should gather only such fundamental figures and information as the large majority of an industry may agree upon;

"2. That while it is perhaps impracticable to devise a standard form of report for lines more or less technical, it is possible to arrange a portion of all reports so that such essentials as *capacity, production, shipments, stocks, unfilled orders,* and *prices on closed transactions* can be reported in a manner that will enable accurate comparisons to be made;

"3. An effort should be made to simplify all statistical reports and bring them reasonably within common rules of reading and interpretation;

"4. (And this suggestion perhaps should be first) the secretaries of all trade associations should devise plans for educating and informing their members as to the value and use of such data in the direction or management of their business;

"5. Close and complete co-operation should be established between trade associations and departments of the Government, particularly the Department over which Secretary Hoover presides, in order that the public, as well as the industries, may participate in the benefits growing out of this work."

What a chance for the trade associations in the heating industry, representing either the manufacturers and contractors, or both, to take a commanding lead in this work.

MORE than once THE HEATING AND VENTILATING MAGAZINE has taken up the cudgels on behalf of more accuracy and less exaggeration in manufacturers' catalogs. Happily, there has been a vast improvement in this direction, even within the last few years. The heating industry has cause to feel well satisfied with the general character of the data issued by manufacturers catering to this field. Handbooks, such as those published, for instance, from time to time, by the vapor heating interests, are of the greatest usefulness to anyone engaged in heating work, whether or not use is made of the particular specialty featured.

We wish we could say as much for the literature issued by many of the oil-burner manufacturers. Picking up a catalog typical of certain types of manufacturers who are entering the oil-burner field, we find such expressions as these: "Oil is burnt without smoke," "Oil is cheaper than coal," "20% higher efficiency can be obtained," "Extracting *all* the heat units contained in the oil and delivering same to your heater or boiler."

If this oil burner manufacturer were attempting to creat a prejudice in the minds of engineers against his product, he could hardly choose a more effective method. Such mis-statements will "get by" the public for a certain length of time, but the more progressive oil-burner manufacturers have long since learned that they must deal with engineers, more particularly with heating and ventilating engineers. It is a matter of fact, as well as a fine tribute, to the advances made in the status of heating as an engineering profession, to say that no body of men is quicker than they are to detect loose statements and engineering fallacies on matters connected with their work. There is plenty to be said in favor of oil-burners, so, by all means, let us get down to principles and facts in discussing this fascinating subject.

A House Built to Keep in the Heat

Ashenhurst Residence in Chicago—Due to Heat Insulation Six Hundred Dollars Was Saved in Cost of Heating Plant, With an Estimated Annual Saving of Two Hundred Dollars in Gas Fuel Cost.

ONE of the latest examples of the new practice in building construction designed to reduce heat losses to a minimum is presented in the accompanying illustrations of a residence built in Chicago and insulated throughout with Insulex, made by the Universal Gypsum Co., of Chicago.

The radiation without the use of building insulation figured 700 sq. ft. of water radiation. Based on the use of Insulex, the radiation was reduced to less than 300 sq. ft. of water radiation.

A Bryant No. 206 four-burner gas boiler is installed, rated at about 278 sq. ft. of water radiation capacity. The house has seven rooms and all space under the eaves has been utilized, so that there is no vacant or unused space in the residence. The cost of insulation came to $441.53 which included 132 hours of labor at 80 cents an hour.

One of the interesting results of the use of building insulation in this case is the fact that last summer, with an outside temperature of 96°, the inside temperature upstairs was 82.3°.

It is planned the coming winter to keep a log of outside temperatures and a recording thermometer will be installed within the house to note the indoor temperature. These will undoubtedly provide some valuable and interesting statistics on the coming winter's operation.

Applying Gypsolite Wallboard

TYPES OF INSULATION FOR RESIDENCES

Under the heading of "Comfort Insurance and Lower Fuel Bills," some useful data for the benefit of the layman is being carried in a number of the daily papers. One appearing recently, on "What Types of Insulation Can I Use in My House?" is particularly well written and timely. It reads:

The insulators which are sold for use in small homes are made of animal, vegetable or mineral substances.

Of animal substance insulators, there is only one: cattle-hair compressed into a mat or felt and backed with paper.

The vegetable insulators are cork, flax-fibre, eel-grass (a seaweed), wood, wood-fibre, sugar cane waste. The cork is compressed and baked into a board, or it is simply granulated and used as a filler. The flax-fibre is compressed into a semi-rigid board, or it is worked to-

Filling Walls With Insulex

How Ceiling of Second Story Room is Sealed Against Heat Losses

gether loosely into a blanket backed with paper. The eel-grass is made into a blanket faced with sheets of paper. The wood is worked into a fairly stiff board covered with a cement and sheets of paper. Wood fibre is compressed into semi-rigid boards or is backed with paper and made into a "quilt" or is shipped loose to be used as a filler. Cane-waste is compressed into a "semi-board."

"Mineral wood" and gypsum are the two minerals used as insulators. The former is "spun limestone" to be used as a filler, or it is mixed with other materials and moulded into board form. Gypsum insulators are made in two different ways: either as rigid boards—"fire-proof lumber"—or as fillers to be mixed with water, which swells the gypsum into a light porous fire-stop and insulator between the studs of a house.

This simple classification of all the insulators on the market will help the prospective home-builder to choose among them. But there is another helpful classification that is from the standpoint of the form in which they are sold. In general, there are four types:

1. Rigid boards. These are made of cork, wood, wood-fibre or gypsum. Some of these do nothing except insulate; that is, they are extra items that must be added to the cost of the house. Others can be used as wallboard, to provide the interior wall-finish. Other insulating boards can be used for fire-protection as well as stopping heat-loss. Others can be used as plaster bases. Others, as sheathing lumber or backing for stucco.

2. Non-rigid boards. Some of these, also, are extra items in the materials-bill. Others, despite their lack of structural strength, are sometimes used for plaster bases or for stucco backing or even for sheathing.

3. Quilts. Since they lack structural strength, the only purpose these materials serve is insulation.

4. Fillers. These are materials which must be poured between the studs of a wall, or over the lath and plaster of a ceiling or between the layers of flooring. Some fillers are loose; others have structural strength. The former serve no other purpose besides insulating but they have some value as fire-stops. An insulating filler which chemically "sets" when poured in place becomes rigid and has structural strength. It also adds to the fire-safeness of the construction.

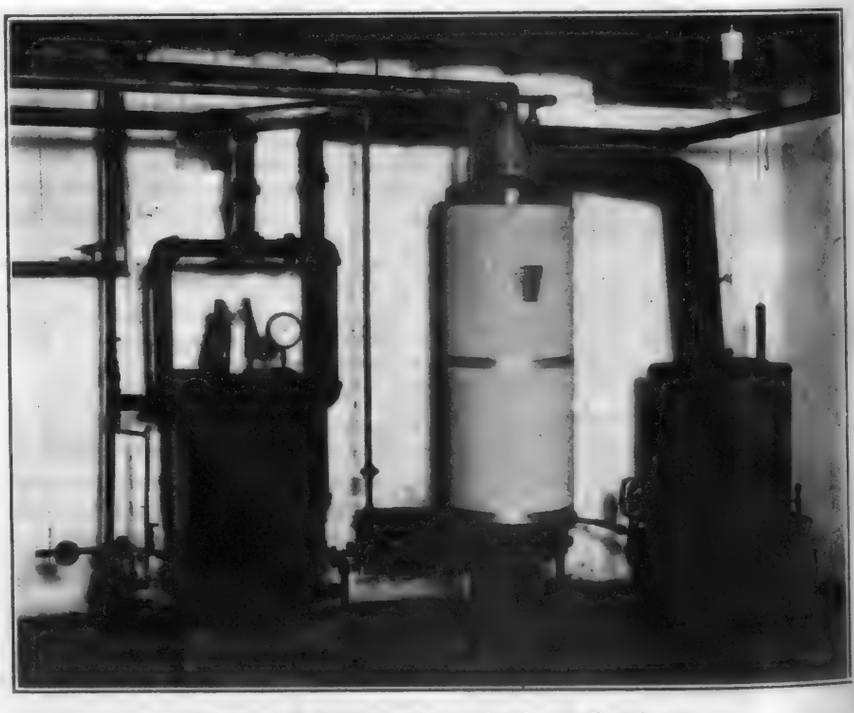
Now this classification prepares the way for an answer to our question.

"What types of insulation can I use in my house?" the prospective builder asks.

"Any of the types described," we may answer. "BUT—and this is the big point—choose one which will do more than just insulate; one which will stop fire, has structural strength and can take the place of lath or sheathing or stucco-backing. Choose an insulator which will combine the qualities of three or four materials in one. Then your insulation will not only save you money by cutting the fuel-cost; it also will reduce the initial expense of building."

Percentage of Air Leakage with Chamberlin Metal Weather Strips

A typographical error in the advertisement of the Chamberlin Metal Weather Strip Co., Inc., Detroit, Mich., in THE HEATING AND VENTILATING MAGAZINE for October made it appear that the Chamberlin equipment in the Majestic Building, Detroit, Mich., (installed twenty-eight years ago) was still preventing 99.3% of the possible inleakage of air. This figure, we are advised, should have read, 93 83/100 which is the amount indicated in the chart accompanying the test data, which appeared in the advertisement.



Heating Equipment for Ashenhurst Residence
Note Size of House Heater as Compared to Size of Water Heater

The Farmer as a Potential Buyer of Heating and Ventilating Equipment

Green Grass to Cured Hay in Ten Hours at University of Wisconsin

SOME interesting experiments conducted by the Department of Agricultural Engineering, of the University of Wisconsin, have indicated the possibility of artificially drying hay, through the use of both heating and ventilating equipment. In a letter to THE HEATING AND VENTILATING MAGAZINE, F. W. Dufee, who has had charge of these experiments, outlines what has already been accomplished and the difficulties yet to be overcome. Mr. Dufee writes: "We have been able to dry and cure hay artificially with considerable success although there are many limitations regarding the process which have not yet been determined, such as the minimum desirable temperature, and the minimum amount of air to most economically cure the hay. Also, we have not discovered the maximum temperature which can be used so as to avoid fire hazard. We have not determined to any very great extent the specifications of the furnace and the fan.

WEIGHT OF DAMP HAY A FACTOR

"This method involves the handling of 3 to 3½ times as many pounds as when the hay is allowed to dry on the ground. Therefore, the machinery for efficiently handling the hay is of importance, and this we have not gone into as yet. One possibility is the use of buck rakes or sweep rakes, together with stackers.

DETAILS OF METHOD FOLLOWED

"The method, briefly described, is as follows: The stack is built over an air cell into which we blow warm air. This finds its way out through the stack, thus drying it out.

"The general specifications of the equipment we have used so far, are as follows: The air cell is 4 ft. wide at the base and 5 ft. high, made A-shaped. The length is 8 ft. shorter than the length of the stack. A large pipe, similar to a furnace pipe, conveys the air from the fan into this air cell, over which the hay is stacked. The base of the stack is supposed to be 12 ft. wide, although it probably can be more. Thus there is a layer of hay 4 ft. all around the base of the air cell. The stack is 14 ft. to 16 ft. high.

"We have been using a No. 2½ Sirocco fan. This size, however, is probably a little too small for a stack the size which we have just used, which was about 20 ft. long and contains 13 good-sized loads of alfalfa hay, which was put in the stack just a few hours after cutting—cut in the forenoon and stacked up in the afternoon. Before the stack was finished, a heavy rain fell, thoroughly soaking the stack. This did not interfere with the drying except that it took a little longer and a little more power.

AIR-HEATED BY FURNACE OF CONVENTIONAL TYPE

"We used an ordinary warm-air furnace for heating the air and connected the furnace warm-air duct to the intake side of the fan. We also turned the smoke stack down and ran it into the bottom of the hot-air jacket of the furnace and blew all of the smoke through the stack. This apparently does not depreciate the quality of the hay in the least. In fact, some claim that the smoked hay is even more palatable than in its natural state. This method greatly increases the thermal efficiency of the drying system and makes it possible to get up a very hot fire in a very short time. The forced draft keeps it burning reasonably clean. The furnace which we used so far has a 36-in. fire-box and is just a common, ordinary warm-air furnace which we picked up second hand.

"The method will work, and work very well. It requires only 8 to 10 hours' steady blowing to thoroughly cure out a stack of this size, if it is stacked uniformly. Uniform stacking is important, otherwise the more compact sides will dry out slower than the other sides.

"At times the temperature in the stack, that is, in the hay itself, was considerably above 200° F. How much, we do not know, as we broke all of the thermometers which we had on hand during the test.

"The air cell is built up of 2 x 4's or 2 x 6's and covered with wire fencing or anything that may be handy, to prevent the hay falling into the cell.

"Roughly speaking, it required about 100 lbs. of coal to dry out a ton of hay. We do not know whether this can be improved upon or not.

"We are very anxious to learn the result of any similar work that may have been done along this line. As mentioned above, one of the serious problems in curing hay in this way, is that of getting the green hay into the stack economically and efficiently, and then moving it a second time into the barn. There is, of course, the alternative of working out a plan to cure the hay in the barn but, so far, we have felt that the fire hazard, connected with this plan, was too great to warrant its general use."

A New Journal for the Jobbing Trade

THE DOTTED LINE, devoted to the wholesale selling of plumbing and heating goods, has made its appearance under the editorship of Harvey A. Call, formerly editor of *Sheet Metal Worker*, of New York. Mr. Call is also the publisher. *The Dotted Line* is a free circulation journal whose purpose is to help the salesman in his sales contact with the plumbing and heating contractors. The new journal has an attractive appearance and will no doubt make its impress on the industries it serves. It is published at 23 Worth Street, New York.

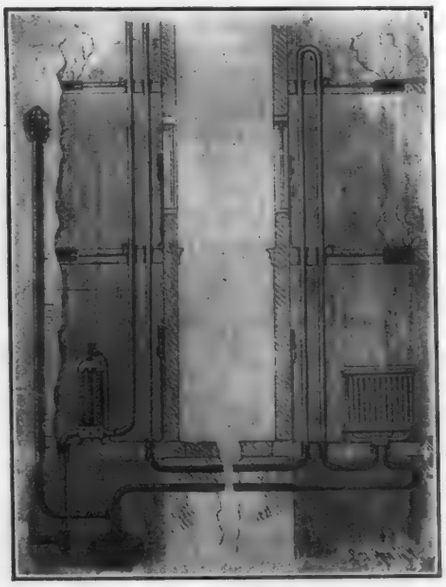
An Old-Time Pneumatic System of Heating, Ventilating and Cooling

RECENT comments on methods of increasing the circulation of air in warm-air furnace heating systems lends interest to the accompanying description of a pneumatic heating system which appeared in an old issue of the *Scientific American* published late in the '90's. The system was the invention of J. H. McLeod of Boston and provided for the circulation at high velocity of fresh warm air through small pipes to possibly a number of buildings, offices and apartments.

The air was to be heated by a warm-air furnace, containing a series of corrugated pipe coils, placed in the path of the burning fuel and gases. It was proposed to drive the air through the piping and coil at about 2 lbs. pressure by means of a blower.

Connections were provided for re-circulating the air when desired. A thermostat and an adjustable valve were provided to control the flow and pressure of the air. It was further provided that in warm weather the circulating pipes could be disconnected from the furnace and air drawn in from the outside and supplied through registers or by means of elastic tubing and spray jets to the desks or tables of occupants of the different apartments.

In the accompanying illustration of the radiator, T represents the thermostat, M the thermostat operating valve which controls the admission of warm air to the radiator N. The illustration (3) shows the interior of the supply valves of the radiator which is operated by cog wheels through a connected rod with handle as shown at the top of the radiator. While J shows the automatic air pressure regulating valve governing the supply of fresh air and regulating the force of the current.



Arrangement of Piping in McLeod System

Application of the McLeod System

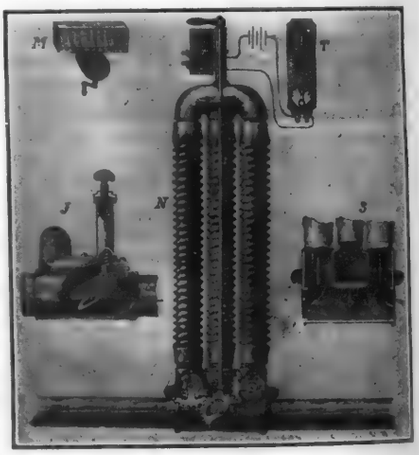
Telling the Public the Story on Oil-Burning

Under the caption "How to Select an Oil-Burner for Your Home," *Good Housekeeping*, in two recent issues, told the story of present-day oil-burner practice in non-technical language. These articles were prepared for *Good Housekeeping*, by F. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE, and resulted in a deluge of letters to the Good Housekeeping Institute, together with several telegrams from readers who desired information in a hurry.

Good Housekeeping Institute has now issued a bulletin, compiled by Mr. Fansler, entitled: "Selecting and Installing an Oil-Burner," comprising sixteen pages of the same size as the magazine. This bulletin is illustrated with photographs and diagrams showing various methods of oil-burner operation and contains valuable information on the installation of burners and accessories, together with a list of burners approved by the Underwriters' Laboratories. It is stated that this bulletin has attracted more attention and had a greater sale than any bulletin previously issued by the Institute, which evidences the wide-spread interest in the use of oil as a domestic fuel. Copies of the bulletin may be obtained from the Good Housekeeping Institute, 107 West 39th Street, New York, at twenty-five cents each.

Revision of New York State Law Relating to Central Station Heating Service

The New York State Senate has passed the Fearon bill, amending the transportation corporation law, Sec. 1, Subdiv. 4, of Sec. 61, Chap. 219 of Laws of 1909,



McLeod Thermostatically-Regulated Radiator

relating to steam heating powers of certain electrical corporations.

The essence of the original law is that: Any corporation, for the purpose of using electricity for light, heat or power in cities other than of the first class, towns or villages, may have and acquire additional power of supplying steam to consumers from a central station or stations through pipes laid in the public streets, etc.

The amended law would change this act so that any such corporation which had steam heating powers *prior to* 1916 may have and exercise such powers in *any city* subject to local authority.

Correspondence

For Longer Life of Smoke Pipes

EDITOR HEATING AND VENTILATING MAGAZINE:

I should very much appreciate any advice you will give me about the following matter:

In my cellar I have a smoke pipe approximately 14 feet long which is the result of having the furnace situated this distance from the nearest chimney. It becomes necessary for me to replace this every two or three years. Will you please suggest some method of putting in a permanent pipe, bearing in mind the fact that provision must be made for cleaning it out.

New York N. I.

NO DOUBT we are all familiar with the usual condition of the sheet-metal smoke-pipe connecting the heater to the chimney, how at first glance it appears to be in good condition, or enough so to weather another season, yet upon slight pressure by the hand at some particular point it crumbles and becomes but mere rust and fragments of its former structure. During the summer months, when the smoke pipe should have been cleaned and laid away in a dry place, it has instead remained connected up in the usual damp cellar where collections of moisture inside, particularly in the horizontal sections of the pipe, have combined with the soot left in the pipe to form sulphuric acid, that deadly agent of destruction which seeks to bring about a leveling process and return such materials as those in mind to their former state.

Such a condition, if pronounced, decreases the draft and increases the fire hazard as corrosion is not apparent until the last stages of life are left in the pipe for it begins inside at some soot deposit and shows on the outside only when complete. Apparently the remedy is to take down the pipe and to put it up again according to the season, but this is an item of expense, a nuisance and unnecessary if the smoke-pipe is provided with suitable cleanouts at proper points and is itself constructed of some rust-resisting acid-proof material. In this connection, copper, as sometimes suggested, is of no value as an acid-proof metal for the service in question.

Keen commercial competition has tended to produce smoke-pipe of perishable material in the lighter gauges, so that the usual thickness or, we might say, thinness of such pipe as carried in stock is only No. 28 gauge. Heavier gauges can be used to increased the life of the pipe, but they are not permanent, as was found throughout the New England States where this practice was adopted. In those States the next step was the substitution of a heavy-gauge pure iron, such as the so-called Armco Ingot iron. This metal is familiar to users of sheet-metal in the construction of ventilating ducts, but its use for smoke-pipe in the New England States is a comparatively recent development and is due to the efforts of Henry Weyand & Co. of Waterbury, Conn, who bought the stock sheets in No. 22 gauge.

Smoke-pipe of such material will last a long time, but even this material without further treatment is not permanent for use as smoke-pipes. Galvanizing oxidizes, seams crack the coating and expansion causes it to loosen, so that eventually the base metal appears, possibly not at first visible to the eye, but nevertheless capable of being seen through the microscope.

USE OF HEAVY-GAUGE METAL, WITH COAL-TAR COATING

A still better method has been developed by the American Rolling Mills Company through its research department at Middletown, O. Sufficient time has not elapsed for proof in practice, but the method is correct in theory and has been successfully tried out for a long time as roof covering in coal mines where the corrosive elements are most active. The method consists in using the same material as previously described, but of still heavier gauge (No. 20), plain black, instead of galvanized, and riveted throughout. It is then painted inside and out with a heavy coal tar which, of course, is not paint, but a substance resembling gas-house tar. This is mixed with 10% of Portland cement. In order to apply the mixture by brush it is necessary to make it less pasty by thinning with benzol, though not more so than required to apply. An interval of two weeks must then elapse for thorough drying; then, with the cement fully set, the tar cannot be cracked and, unless scratched in some manner, the fumes cannot get at the metal. Smoke-pipe of such material and so treated should outlast the more usual smoke-pipe in a ratio of ten to one. This method, though quite expensive, gives a better job and is probably cheaper in time as it avoids the expense of frequent renewals.

T. W. REYNOLDS.

"Modulated" or "Controlled" Heat

EDITOR HEATING AND VENTILATING MAGAZINE:

In your October issue I have read, with a great deal of interest a letter from G. D. C. of Brooklyn, N. Y., lamenting certain "favorite expressions in the terminology of the industry."

It has always been my observation that the answers to the "Vox Populi," "Pro Patria" and "G. D. C." letters appearing in the news and trade papers usually emanate from individuals or firms with axes to grind and so, I suppose, I might as well confess at the outset that the particular axe in my own case—and the grind is daily, except Sundays and holidays—is the sale of "Controlled Heat" and other specialties.

G. D. C. has written a rather long letter and I think that the best method of answering it is by taking it a paragraph at a time, so here goes:

In his first paragraph, G. D. C. states that "modulated" and "controlled" heating systems are favorite expressions in the terminology of the industry. He then asks several questions:

1. "Frankly, what do they mean?" The answer to this can be found in any dictionary. I will agree that the word "modulated" does not mean what is intended—probably that is why some companies use the word "controlled."

2. "What should we expect of a thing that is modulated?" Substituting the word controlled as the last word in this question, my answer is that we should expect of such a thing that it may be (see dictionary) regulated, checked or restrained.

3. "Should we expect to modulate it ourselves?" Answer, yes. G. D. C., in his fourth question in this paragraph, merely repeating question No. 3, admits that these systems are not advertised as automatically modulated.

In his second paragraph, G. D. C. makes a rather lordly and inclusive donation of privileges to the manufacturers of automatic temperature control but, as even a criminal should have his hearing before being deprived of his liberty, so I beg to be heard before being deprived of the use of the word in question. G. D. C. states that a control valve does not mean controlled heat but that a controller is required to fulfill the term. Surely G. D. C. is laughing at us. Or does a check valve require a checker and a blow-off valve a blower-off (or should I say a blow-offer) before they may be called what we call them?

In his third, fourth and fifth paragraphs, G. D. C. gives the results of an experiment made by him and the conclusions reached through it. I will assume merely for the sake of argument and because decimals to more than two places make me exceedingly weary, that his figures are correct. The conclusion is that a ½-in. modulating (?) valve can have the disc barely off the seat before

the area opened to the passage of steam is too large to permit of control. Can G. D. C. have been so lax in his perusal of the advertising pages of your splendid magazine that he has not read of at least one valve whose orifice can be permanently adjusted at any point between full open and completely blanked off, and whose rising and falling disc then achieves the (excuse me) control—providing, of course, that there is a controller to operate the handle? Needless to add, it is one of the specialties I handle and I am enclosing a descriptive pamphlet which I will ask you to mail to G. D. C., if you have his address.

The gist of the sixth paragraph is that, because of the many factors affecting the temperature in a room, it would be impossible for the occupant to control the temperature, even if the radiator were equipped with a mechanically perfect modulating valve. In this paragraph G. D. C.'s reasoning is distinctly at fault, for he is confusing the control of steam to the radiator with the control of temperature in the room. The manufacturers of this class of specialties merely state that the amount of steam entering the radiator can be controlled. The accuracy of this control should, of course, govern the accuracy of room temperature, but there is always the possibility that the radiator is far too small to heat the room under almost any condition. Would G. D. C. blame the modulating valve in that case?

THE "MOVEMENT OF THE SUN."

In this same paragraph, G. D. C. uses the expression "movement of the sun" and if, as he mentioned in his second paragraph, the English language is going to continue to mean anything, I think that G. D. C. ought to alter his phraseology or plead guilty to ignorance of the most elementary astronomy. I really hate to inject astronomy into the discussion but, you will admit, I cannot miss any points in warding off this ferocious attack on my means of livelihood.

In his seventh paragraph, after damning the possibility of a successful performance, G. D. C. permits the imaginary occupant of his room sufficient idleness to modulate the radiator valve once an hour and asks (and I can almost hear him snicker as he asks it) "how much would he open or close it?" Not being given any of the necessary details, but being rather proud of my ability at repartee and similar games, I snap back, in my best executive manner, "where was Moses when the light went out?"

G. D. C.'s eighth paragraph, which he calls "the last statement of a practical fact," says that 90% or more of the people using direct radiators open the valve wide when they are cold and close it altogether when they are warm. This may, of course, be a statement of fact. Also, it may be a guess—of the type vulgarly known as "juicy." But whether it is a fact or a guess, it merely proves that 90% or more of the people using direct radiators either do not have modulating valves with which to control their radiators or, if they have do not use them as they might. Some people brush off their shoes with their pocket handkerchief. Why blame the manufacturer?

In his closing paragraph G. D. C. asks, for the sake of accuracy and justness to all, that manufacturers should not assert that their systems automatically control the amount of heat given off by a radiator. My answer is that they do not and that G. D. C. admitted it in the first paragraph of his letter.

Perhaps I have poked a little fun at G. D. C.—and perhaps he will forgive me. But really, isn't it rather futile to complain of trade terms unless one has something better to suggest? And isn't it rather usage that moulds the language than language that governs the usage? Have X-rays any X's in them? Can a pianist play with "feeling?" Can a picture really have atmosphere? And wouldn't anybody call it justifiable homicide if one murdered the man who says that he just heard a delicious story?

In closing, permit me to say, with perfect modulation and complete control, that I am, sincerely,

New York HENRY P. KAHN

Figuring Radiation for an Enamel Drying-Room

EDITOR HEATING AND VENTILATING MAGAZINE:

We are required to furnish sufficient radiation for an enamel drying-room at the plant of the Ford Motor Company. The room is in about the center of the plant and is 12 ft. x 14 ft. x 9 ft. and is baffled so that when one car is in the opening there is no room on either side. The room is to be heated to 150° F.

Memphis, Tenn. ALEX. T. BEVIL

This is evidently an oven for drying automobile bodies or chassis and the mass of the article and time of operation must be taken into consideration. We will assume:

1. That the article to be enameled is iron or a chassis weighing 1500 lbs., and the enamel a fluid paint to be evaporated by means of latent heat.

2. That the air contained in the space is completely changed for each operation and raised to 150° F. temperature from the surrounding air, say, 50° F. Then, 14 x 12 x 9, or 1512 cu. ft. equals the subic contents of the room.

3. That the room is insulated with 1½ in. of magnesia on all sides, top and bottom $(52 \times 9) + (168 \times 2) = 804$ sq. ft.

We have all the elements in the problem for the quantity of heat, and if 50 lbs. of steam were used at a temperature of 300° F., we would have a difference of 150° between the room and the steam coil. This would give a rate of 2 B.T.U. per hour per square foot per degree difference, or 300 B.T.U. per square foot.

Raising 1512 cu. ft. of air 50° (0.24 specific weight) to 150° F. (0.075 specific weight) will require $1512 \times 0.24 \times 0.075 \times 100° = 2722$ B.T.U.

Specific heat chassis = 0.12 per pound.

1500 lbs. × 0.12 × 100° = 18000 B.T.U.

The loss through the walls per hour with 1½-in. magnesia covering will be 0.3 B.T.U. per square foot per hour.

800 × 0.3 × (150 — 50) = 24000 B.T.U.

Heat supplied contents each.
time article is changed.. 2722 B.T.U.
Heat supplied article heated 18000 B.T.U.
Additional heat (15%) for
evaporation of fluid having latent heat..... 2700 B.T.U.
Radiation through sides of
room per hour..... 24000 B.T.U.

47422 B.T.U.

Figuring on 50,000 B.T.U., with a coil using 50 lbs. of steam we have 50,000 $(150 \times 2) = 160$ sq. ft.

Note carefully the radiation from the room is based on hourly losses while the air change and the drying and heating of the article are dependent on the time of immersion which is somewhat limited in practice. The recirculating system, with a blower and indirect stack, would materially accelerate the period of heating up.

If the foregoing does not fit the conditions of the problem it may be easily changed to those existing.

Ban on Soft Coal Lifted in New York City

Due to the strike in the anthracite coal industry and the growing scarcity of hard coal, Dr. Frank J. Monaghan, health commissioner of New York, has ordered the ban on soft coal to be lifted. This, it is explained, is a temporary measure. The section of the sanitary code applying to this subject is Sec. 211 which will be rescinded for the present.

In announcing the lifting of the ban on soft coal, Mr. Monaghan issued a statement to the effect that "it is strictly understood that the furnaces must be operated so as to discharge a minimum amount of smoke, and that leniency will only be shown during the period of the hard-coal shortage."

According to General Charles W. Berry, chairman of the New York State Coal Commission, the situation in New York City on October 19 was that there was plenty of soft coal available. In addition, there was approximately 200,000 tons of anthracite for distribution. The coal dealers, however, were hesitating to order further soft coal unless a demand was created. "It is up to the public," declared General Berry, "to prevent a serious situation later."

American Society of Heating and Ventilating Engineers

Pittsburgh Chapter Undertakes to Build a Heating Research Residence

The important news that the Pittsburgh Chapter of the American Society of Heating and Ventilating Engineers has undertaken the project of building a Heating Research Residence for use in testing all type of heating systems, was announced by William H. Driscoll, chairman of the society's Committee on Research, at the October meeting of the New York Chapter, at the Building Trades Club, October 19. Mr. Driscoll was speaking of the enviable position in which the society's Research Laboratory has been placed through the added income derived from the increase in the members' dues. Contrary to the expectation of some, he said, the loss of members through the increase of dues had been negligible, while the number of new applications had more than made up the loss.

In its plans for proceeding with research work, at the laboratory, Mr. Driscoll said that technical advisory committees had been appointed for each subject under investigation. Among the subjects on which work is being started are:

Air temperature, humidity and air motion (W. H. Carrier, chairman); radiation, with particular reference to the elimination of steam-type radiators; studies in air elimination (R. V. Frost, chairman); infiltration (Professor A. C. Willard, chairman); pipe sizes (Professor F. E. Giesecke, chairman).

In addition, said Mr. Driscoll, it is proposed to appoint a committee on subjects, and he predicted that before long the Research Laboratory would find work for all of the members of the society in connection with its activities.

He then told of the movement for the construction of a Heating Research Residence and stated that the Pittsburgh Chapter would have the project definitely under way before the first of the year.

President A. A. Adler then presented Carl Snyder, economist of the Federal Reserve Bank of New York, who discussed "Business Conditions."

Mr. Snyder illustrated his talk with a number of charts showing the course of business for the past 50 years. He emphasized the fact that we are now at the high tide of a business boom. One of the interesting comments, made by Mr. Snyder, was that pig-iron, railroad traffic and similar statistical data were no longer a criterion of industrial activity, but that, on the other hand, a far better gauge is supplied by the composite figures covering a variety of industries. Mr. Snyder answered numerous questions with which he was bombarded at the conclusion of his talk.

Buffalo Selected for Annual Meeting

Announcement is made that the next annual meeting of the American Society of Heating and Ventilating Engineers will be held in Buffalo, N. Y., January 26-29, 1926. In making this decision the officers and council of the society accepted the urgent invitation of the Western New York Chapter members to meet at the Lake City. President W. G. Fraser of the Western New York Chapter has announced the selection of the new Hotel Statler as the headquarters for the annual meeting. Local committee work has been organized for handling the program. To comply with the constitution an opening business session will be held in New York, January 26.

Among the more important matters scheduled to come up at the coming meeting are the proposed amendments to the constitution offered by the Kansas City, Illinois and Pittsburgh chapters.

Resignation of F. C. Houghten as Secretary

F. C. Houghten, secretary of the American Society of Heating and Ventilating Engineers, whose appointment as director of the A.S.H. & V. E. Research Laboratory was announced last month, has resigned as secretary. President Dibble and three members of the Executive Committee were authorized to investigate the matter of a new secretary and report at the next meeting of the council. In the meantime Manager of Publications A. V. Hutchinson is acting as secretary.

Officers Nominated for 1926

The following nominations are announced by the society's Nominating Committee, consisting of H. P. Gant, chairman, Alfred Kellogg and C. G. Morgan:

For president, William H. Driscoll, Long Island City; for first vice-president, F. Paul Anderson, Lexington, Ky.; for second vice-president, Professor A. C. Willard, Urbana, Ill.; for treasurer, Walter A. Gillham, Kansas City, Mo.; for members of council: W. H. Carrier, Newark, N. J., J. A. Cutler, Chicago, Ill., S. E. Dibble, Pittsburgh, Pa., C. V. Haynes, New York, W. T. Jones, Newtonville, Mass., E. B. Langenberg, St. Louis, Mo., Thornton Lewis, Philadelphia, Pa., and J. F. McIntire. For the Committee on Research the following have been nominated: W. H. Carrier, S. E. Dibble, C. F. Eveleth, H. P. Gant and A. B. Langenberg.

Research Laboratory's Program

At a recent meeting of the Committee on Research of the American Society of Heating and Ventilating Engineers, approval was given to the program of work to be conducted at the society's Research Laboratory, as announced by Chairman William H. Driscoll. Four general problems will be considered: (1) temperature, humidity and air motion; (2) infiltration; (3) pipe sizes and (4) radiation. The condition of the laboratory, from a financial standpoint, it was reported, is excellent.

Illinois Chapter Elects Officers

New officers were elected at the annual meeting of the Illinois Chapter, held October 12, at the Hotel Sherman, as follows: President, A. P. Martin; vice-president, E. P. Heckel; secretary, H. G. Thomas; treasurer, August Kehm. Board of directors: Homer Linn, J. D. Small and J. A. C. Cutler.

In handing over the gavel to Mr. Martin, the retiring president Homer Linn welcomed him to the chair. He told of the preparations the Western New York Chapter is making for the annual meeting of the society in Buffalo in January, where an attendance of upwards of 700 is expected.

President Martin pledged the continuance of the work carried on by the retiring and former officers and urged a deeper spirit of fellowship among the chapter members. He commented on the fact that the personnel of the profession in Chicago is changing, with many men coming from the universities into the offices of architects and contractors. These men, said Mr. Martin, must be "sold" on the advantages of chapter membership.

The principal speaker of the evening was Charles Henry MacIntosh, formerly president of the Associated Advertising Clubs of the World. His subject was "Sales and Service." In the discussion following his address, Mr. Kehm brought up a motion presented at the last chapter meeting providing for a competition to attract, interest and help the younger men in the profession. It was suggested among other things, that three meetings be turned over to three different groups in a competition for the most interesting and valuable meeting.

After further discussion Mr. Kehm made his motion to read that a competition be provided for a heating layout,

with three cash prizes, the details to be handled by the board of governors. This motion was passed.

Another suggestion made by Mr. Kehm was for the publication of a chapter periodical, on the lines of the "Radiator," issued by the St. Louis Chapter. It was voted to appoint a committee to report on this matter at the next meeting. Another committee, consisting of J. Doherty, M. Good and T. Monaghan, was appointed to arrange for a chapter golf tournament to be held before the season closed.

The following were elected to membership in the chapter: A. A. Aiff, E. J. Bolling, H. J. Kreissel, J. Mathy and F. L. Pearson. The attendance was 81. Secretary Thomas announced that the Hotel Sherman would be the regular meeting place of the chapter for the season.

New Officers for Wisconsin Chapter

The new officers of the Wisconsin Chapter, elected at its opening meeting, held September 15, at the Medford Hotel, are as follows:

President, R. G. Olson; vice-president, H. W. Page; secretary, F. R. Dannies; treasurer, William H. Wilson. Board of governors: William F. Noll, C. W. Miller and Professor G. L. Larsen.

Philadelphia Chapter Takes Up Unit Ventilation

"Fundamentals of Unit Ventilation and Their Application" was the principal topic for discussion at the opening meeting of the Philadelphia Chapter, at the Engineers' Club, Philadelphia, October 5. A. J. Nesbitt, of John J. Nesbitt Inc., Atlantic City, N. J., manufacturer of the Universal unit ventilation system, was the principal speaker. His talk was illustrated by lantern slides. C. V. Haynes, vice-president of the Hoffman Specialty Co., Inc., New York, discussed the operation of thermostatic valves and traps and answered numerous questions on the subject. President R. P. Shoenijahn was in the chair.

Oil Burning Discussed by Kansas City Chapter

With representatives present from Oil-o-Matic Oil Burner Company, the A. B. C. Oil Burner Company, the Combustion Equipment Company, Security Oil Burner Company and the Lientz Oil Burner Company, all of whom have made numerous installations of oil burners in Kansas City buildings, the members of the Kansas City Chapter, at their October meeting at the University Club, October 14, were given some up-to-the-minute information on the rapid advance of this industry.

Oil burning from its inception down to the present time was reviewed, as well as the progress in properly atomizing oil for the best combustion. The need of closer co-operation between the heating and ventilating engineer and the oil burner man was emphasized, and it was brought out very forcefully that one cannot get along well without the other.

During the winter, it was announced by President Nate W. Downes, the chapter is planning to feature similar discussions covering the various problems confronting the heating and ventilating engineer. Ben C. Naylor is chairman of the chapter's Publicity Committee.

Kansas City Chapter's Program

Four general topics for discussion have been selected by the Kansas City Chapter for discussion this season. These include: (1) steam versus furnace heating for school houses, (2) smoke abatement, (3) central heating versus individual heating plants and (4) oil burning. The chapter's newly-elected officers are: President, Nate W. Downes; vice-president, B. F. Cook; secretary, R. B. Johnson; treasurer, B. C. Naylor. Board of governors: W. N. McIntyre, David Caleb and C. H. Carr.

At the chapter's opening meeting, held at the University Club, Kansas City, September 24, it was brought out that the chapter's code committee is planning to use its efforts to carry through the city council the proposed building code, recently completed and sponsored by the Chamber of Commerce. An important feature of this code is its heating section.

On the subject of the evening, "Individual versus Central Heating Plants," David Caleb presented a paper favoring the central heating plant and Ralph B. Johnson followed with a paper on "The Individual Plant." Mr. Johnson referred particularly to the use of gas-fired furnaces, with temperature control.

Western New York Chapter Sees Movies of American Radiator Company's Plant

Frank B. Howell, head of the Research Bureau of the American Radiator Company, was the principal speaker at the opening meeting of the Western New York Chapter, held at the Hotel Buffalo, Buffalo, N. Y., October 5. Mr. Howell presented five reels of motion pictures showing all the departments of the American Radiator Company's plant in operation.

Gas Convention Reflects Progress of Industry

A PROGRAM remarkable for its extent and variety and an exhibition of apparatus and appliances which surpassed in extent that of any previous meeting, furnished convincing evidence of the advance of the gas industry, as exemplified at the seventh annual convention of the American Gas Association, held in Atlantic City, N. J., October 12-16.

As usual, the Steel Pier was given over entirely to the convention and exhibition, the exhibits occupying the major portion of the available space on the pier. The general meetings were held in the convention hall at the end of the pier, while the different sectional meetings were held in various meeting rooms. The industrial gas section, which included the house-heating interests, met at the Chalfonte.

Among the papers of direct interest to heating men were the following:

"Is the Gas Company Ready to Accept the Responsibility of Entering the Fuel Field in Competition with Other Fuels?" by Henry E. Loebell, vice-president of the Combustion Utilities Company, of New York. (Mr. Loebell's views on this subject were presented in an article by him in THE HEATING AND VENTILATING MAGAZINE for September, 1925, discussing the use of a combination gas-and-oil burner).

"Selling House Heating," by E. L. Hall, general superintendent of the Portland, Ore., Gas & Coke Company.

"Progress in House Heating," by E. P. Bailey, Jr., chairman of the association's House Heating Committee.

"Gas Versus Competing Fuels," by D. W. Chapman, of the People's Gas Light & Coke Company, Chicago.

"Insulation," by L. E. Cover, of the Armstrong Cork & Insulation Company, Pittsburgh, Pa.

"Heating Appliances," by H. L. Whitelaw, of the A. H. Wolff Gas Radiator Company, New York.

Among the exhibitors were:

Abendroth Bros., Port Chester, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Automatic Gas Steam Radiator Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
The Bristol Co., Waterbury, Conn.
C. L. Bryant Corp., Cleveland, O.
Bryant Heater & Mfg. Co., Cleveland, O.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
The Cleveland Gas Burner & Appliance Co., Cleveland, O.
James P. Clow & Sons, Chicago, Ill.
The Columbus Heating and Ventilating Co., Columbus, O.
Combustion Utilities Corp., New York.
Connersville Blower Co., Connersville, Ind.
The Dunham Co., Berea, O.
Johns-Manville, Inc., New York.
The Linde Air Products Co., New York.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Mueller Co., Decatur, Ill.
National Tube Co., Pitsburgh, Pa.
Peerless Heater Co., Pittsburgh, Pa.
Republic Flow Meters Co., Chicago, Ill.
B. F. Sturtevant Co., Hyde Park, Mass.
Walker & Pratt Mfg. Co., Boston, Mass.
The A. H. Wolff Gas Radiator Co., New York.

In addition, special house-heating exhibits in the form of model basements were featured at the Boardwalk entrance to the Steel Pier by the A. H. Wolff Gas Radiator Company, New York, and by the Columbus Heating & Ventilating Co., Columbus, O.

Electric Heat for an Insectary

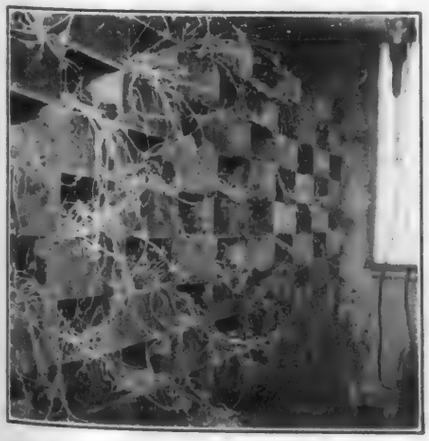
The San Joaquin County Insectary, Lodi, Cal., is the first insectary to use electric heat. The practice hitherto has been to use gas or other fuels, with manual temperature control.

This insectary is engaged in research work to determine the possibilities of using the beetle bug, or so-called lady-bug, to rid vineyards of the mealy bug, a pest which is causing much loss.

Beetle bugs live and thrive solely on mealy bug. Thus, in the process of raising them, it is first necessary to raise mealy bugs to feed and fatten them. For this purpose potatoes are planted in small trays filled with a few inches of soil. Each room contains sufficient trays of potatoes to plant the equivalent of an acre. The rooms are kept dark and held at a constant temperature of 65° F. until the potatoes have sprouted and developed long shoots. The purpose of a dark room is to cause the sprouts to grow long and spongy with a minimum of leaves.

After the sprouts have developed, a few mealy bugs are planted on them. The temperature from then on is maintained constant at 80° F., causing the mealy bugs to multiply very rapidly, each hatch producing about 600 eggs which hatch into bugs in about a month. After the mealy bugs have developed, beetle bugs are placed on the sprouts to feed on them.

The San Joaquin County Insectary has four rooms, each approximately 12 ft. long, 6 ft. wide and 8 ft. high. In each room is installed an Edison Electric Appliance, 2-K.W. heater. Temerature is regulated by a CR-2990 thermostat and CR-7002 contactor, both of General Electric manufacture.



Dinner Table at Insectary with Sprouting Potatoes

Exterior View of Insectary, showing Extra Roofing to keep the Building Cool

British Heating Engineers Meetings Schedule

Following are the subjects announced for presentation at the various meetings, during the coming season, of the (British) Institution of Heating and Ventilating Engineers:

November 4—The Modern Development of Combustion Recording, by J. J. Lassen.

December 2—The Requirements of Ablutionary and Recreative Bathing Establishments as Affecting the Heating and Ventilating Engineer.

January 6—Pump Circulation, by J. Roger Preston.

February 10—(annual meeting). Engineering Services in Hospitals and Asylums, by Herbert G. Cathcart.

March 3—The Design and Application of Electric Motors Relating to Heating and Ventilating Installations.

For the summer general meeting, to be held during June, 1926, a paper on "Air Heaters" has been promised by J. W. Cooling.

The Chemical Industries Exposition

Ten years of American chemical progress were epitomized at the Tenth Exposition of Chemical Industries which closed at the Grand Central Palace, New York, on October 3, after one of the most successful expositions ever held in the United States. Attendance records show that 67,836 persons visited the exposition and that of this number, 12,464 registered as representing some branch of a chemical, chemical process, or chemical consuming industry.

There were slightly less than 400 exhibits from industrial organizations.

The next Exposition of Chemical Industries, the eleventh, will be held at the Grand Central Palace, New York, two years hence, during the week of September 26 to October 1, 1927. Although the Eleventh Chemical Exposition is two years off, the majority of leading exhibitors have already contracted for their spaces for 1927.

The Aerologist

Under the title of *The Aerologist*, a new journal has made its appearance in the ventilating field. It is edited and published by E. Vernon Hill, of Chicago, whose claim to the title of the original "aerologist" has never been questioned. An idea of the scope of *The Aerologist* may be gained from a list of typical articles appearing in its second issue. These deal with "Municipal Control of Ventilating Practice," "The New York State Commission's Report—What Is Its True Value?" and "Ventilation Requirements for Public Buildings," being Section 2 of the A.S.H & V.E. Compendium of Modern Practice. It is stated that a department on theatre ventilation and cooling, to be conducted by O. W. Armspach of the E. Vernon Hill Company and formerly on the staff of the A.S.H. & V.E. Research Laboratory, will be a regular feature of *The Aerologist*.

Judging from the initial issues, the new venture appears to be well sponsored and *The Aerologist* may be expected to keep its readers well abreast of the developments in ventilating practice, if not a step in advance of the art.

DIRECTORY OF HOME STUDY COURSES, offered by the St. Louis Technical Institute, has been issued in a new edition. The institute was established in 1910 and is under the direction of O. W. Kothe. The courses in heating and ventilating include heating and ventilating engineering, special warm-air heating, special steam fitters' studies, and heating and ventilating business studies. The directory gives a synopsis of each course. A typical plan of fan heating and ventilation indicates the scope of the lessons. Size 6 x 9 in. Pp. 128.

Proceedings of the National Convention of Nokol Dealers

WITH an attendance of no less than 240 delegates from dealer organizations in different parts of the United States and Canada and with a three-days' program which would do credit to a convention of the industry, the recent second annual convention of Nokol dealers, in Chicago, had practically all of the characteristics of a meeting of the trade. Nineteen speakers were down on the program for addresses, papers and discussions.

The entire proceedings have been published by the American Nokol Company, of Chicago, in a special edition of the *Nokol News*. Among the addresses given in full is that of President Morgan J. Hammers, of the American Nokol Company. Other addresses and papers presented in the convention issue, include the following:

"Benefits to Health from Automatic Oil Heating," by Dr. Herman N. Bundesen, health commissioner of Chicago; "Nokol Engineering Policy," by Vice-President Frenier; "Factory and Dealer," by H. E. Hallenbeck, of the Albany Nokol Company, Albany, N. Y.; "Boiler Controls for Nokol," by Lawrence Davis, of the Automatic Oil Heating Company, of Springfield, Mass.; "Credit Sales and Financing in the Oil Burner Business," by Carl E. Truax, of the Oil Heating Company, Chicago; "Nokol in the City of New York," by Charles S. Winston, of the Cornell Utilities Company, New York; "Special Installation Methods," by A. J. Becker, of the St. Louis Nokol Company, St. Louis, Mo.; "Future Oil Burning from the Dealers' Standpoint," by H. E. Dexter, of the Ideal Heating Company, Kansas City, Mo.; "Oil Burning in Large Buildings," by W. Schwan, of Gillspie & Schwan, Dallas, Texas; "Five Years with Nokol," by E. D. Purdy, of the Automatic Heat Corporation, Detroit, Mich.; and "Facts and Figures on Oil Heat," by Joseph Harrington, Chicago.

Scheme for Eliminating Leaks in Oil Pipe Lines

Among the other papers, one by A. J. Becker on "Special Installation Methods," contained some interesting notes on the difficulties experienced due to leaks in the oil pipe line between the top of the storage tank and the point where the oil lines enter the burner. On this point Mr. Becker said:

The average oil line contains from eighteen to thirty individual joints between the point of discharge at the tank, and the float chamber of the

President Morgan J. Hammers, of the American Nokol Company

burner. This is, of course, figuring two individual joints for each pipe fitting. About half of these joints are between two standard fittings, while the balance come between a standard fitting and a pipe thread cut by hand. It is only necessary for a mechanic to cut one of these eight to fifteen pipe threads improperly to produce a joint which will in time show oil leakage. It is quite true that a pipe thread properly cut will make a tight seal without any kind of dope; but it is also true that it is impossible to make a tight seal with a pipe thread cut too deep, regardless of the character or quantity of dope used. And in actual practice it is impossible to get unformly perfect threads, even with workmen far above the average. The same joint that would hold water or gas will not hold oil by any matter of means—it takes an exceptional mechanic to unfailingly make up oil joints that are tight.

EXPERIMENTING WITH TROUBLE

In trying to solve this we considered various materials. Bent pipe was unsatisfactory and ineffectual. It did not make a neat looking job, and the chance of opening a seam was almost as great as that of a leak at a joint. Copper tubing struck us as being ideal, but of course, not sturdy enough. Then the idea came to us—why not copper tubing encased in a protective covering which would supply the strength which the tubing itself lacked.

After some study we decided to try out an armor covering of the common garden variety of BX. The problem naturally arose—was this material resistant enough. To satisfy ourselves we made up several samples of copper tubing in BX which were tested under our direction in the Mechanical Engineering Laboratories at Washington University. I shall not attempt to review all the tests that were carried out, but, I believe a few of the more important results will be interesting.

Material—7/16-in copper tubing covered with ⅜-in. flexible BX armored cable. Tests showed that this material required a load of 2,000 lbs. applied by the flat side of a 1-in. cube in order to effect any appreciable deflection. It further showed that under the same condition at 5,000 lbs., the tubing was practically closed, and at 10,000 lbs. was closed air-tight, no break taking place in the copper tubing.

Under a similar test ⅜-in. wrought-iron pipe split on both sides of the pipe under a load of 3,600 lbs. Obviously, under a crushing load the resistance of the armored tubing for the purpose desired was far superior to the wrought-iron pipe.

Under a shearing load, as applied by the sharp edge of a 1-in. polished steel cube, the armored tubing showed that deflection began to take place under a load of 1,000 lbs. At 3,400 lbs. the tubing was practically closed. At 5,100 lbs. it was closed air-tight, and at 6,200 lbs. the tubing and cable were sheared in two.

Under this shearing action, however, the tubing had first been mashed shut air-tight, and when it was finally sheared both ends at the place where the shear took place were closed air-tight, showing that had there been oil in the pipe under such a shearing load, none of it would have flowed out of the pipe.

Similar tests on ⅜-in. wrought-iron pipe showed that such pipe could not be sheared under a load up to 10,000 lbs., but the greater resistance of the pipe in this case was far more than offset by the more satisfactory action of the armored tubing under crushing load. All in all the tubing in cable showed properties far more desirable for oil lines than did the wrought-iron pipe.

IMPRESSED WITH TESTS

The results of these tests and the samples, were presented to the St. Louis Fire Prevention Bureau, representatives of the Underwriters Laboratories. Mr. Madison of the Bureau was sufficiently impressed to present them for us at the recent Chicago Convention of the National Fire Protection Association, where they received very interesting comment.

Iso-Oil-Consumption Chart

(Based on The Iso-Degree-Day Chart, Published as a Supplement of The Heating and Ventilating Magazine for September, 1925)

In the derivation of data from which these lines were drawn, reports of the U. S. Weather Bureau from nearly 500 stations, and covering a period of fifty years, were used, and as many points plotted. The list, as printed on Data Sheet No. 5, has been shortened, to eliminate points of little importance, except as used to locate the lines. Over 12,000 calculations were required to make possible the presentation of this chart. Figures in circles designate cities, which are listed on Data Sheet No. 5.

P. E. F.

Assumptions

Figures on contour lines represent total oil consumption in gallons, necessary to supply heat for 1 sq. ft. of steam radiation for one normal heating season, based upon the following assumptions:

Heating value of oil, 140,000 B.T.U. per gallon.

Efficiency of heating unit, 100%.

Figures are oil consumption per square foot of steam radiation.

For water radiation, multiply oil consumption for steam by ⅝.

Calculations are based on radiation figured for 0° F. outside temperature, and 70° F. inside temperature.

If consumption is desired for radiation installed for:

— 10° F. outside temperature, multiply by 7/8.

+ 10° F. outside temperature, multiply by 7/6.

+ 20° F. outside temperature, multiply by 7/5.

Oil consumption for any intermediate degree-day value may be found by interpolation.

Degree-Days for Measuring Heating Requirements

"Degree-Day" is a clever word-coinage, designating a unit by which heating requirements may be measured, and comparisons made between heating loads under different climatic conditions or at different points. *It is the product of a degree of temperature, and a time factor of one day.* In common with nearly all units, an empirical element is necessary, this being the zero point in the computations. So the American Gas Association, the source of the "d.d." unit, through a study of actual conditions, determined that the minimum temperature of bodily comfort in the home is reached when the mean daily temperature falls below 65° F. It must be borne in mind that, with a daily *mean* temperature of 65° F., the day-time temperature will average around 70° F., and the only time room temperatures would be below the comfort point would be around midnight. This explains the derivation of this arbitrary figure.

Manifestly, for each locality there may be determined the number of days of the year for which the average temperature is below 65° F. This period may be called the heating season.

If, then, we have a mean daily temperature of 60° F., it is evident that, for this day, we can measure the heat requirements by the figure "5°-days," whereas, had the mean temperature been 55° F., the heat requirement would be measured by "10°-days," or would be twice as great.

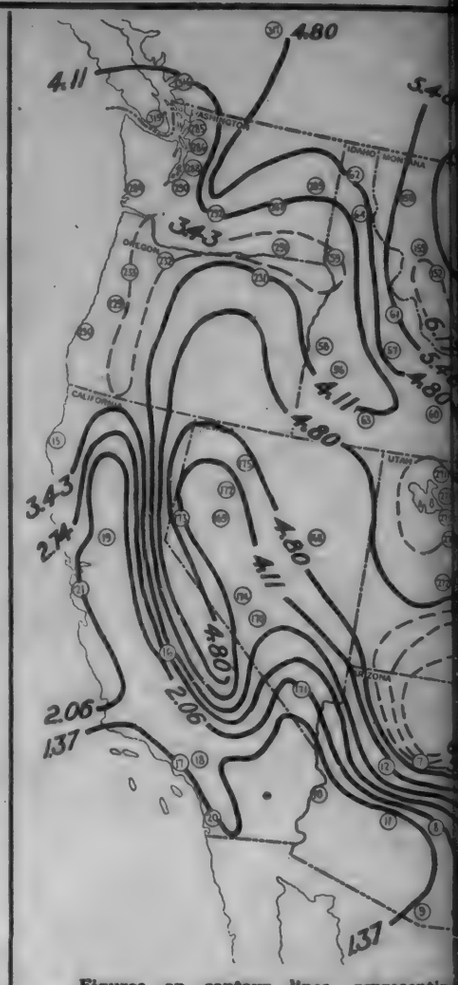
Summing up, therefore, for a week, or a month, or a heating season, we may express the aggregated heating load of any locality in units that permit comparison with that of any other point. Likewise, we may compare the heating requirements at any given place, during one heating season, with those of any other heating season. And so a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.T.U. Basing these units on the very accurate data of the weather bureau over a period of fifty years, a high degree of accuracy results.

The Iso-Degree-Day Chart

It would seem but logical to extend the usefulness of the "degree-day" unit by cohering the individual data in graphic and easily applied form.

This amplification has been developed along the lines of the charts furnished by the United States Weather Bureau, and, adopting simi'ar nomenclature, the result has been designated an "Iso-Degree-Day Chart."

Calculations were made for over five hundred cities and towns, on the basis of weather bureau averages taken from fifty years' observations. With these figures noted on a map of the area under consideration, it becomes possible to draw lines across the map, representing equal heat requirements. These lines have been drawn to represent degree-days in multiples of 1000, and, roughly, nine lines cross the United States. Those in Canada are deduced from data supplied by the Dominion Metereological Service.



Figures on contour lines, representing total oil consumption per normal heating season, may be converted to degree-days of the following evaluation:

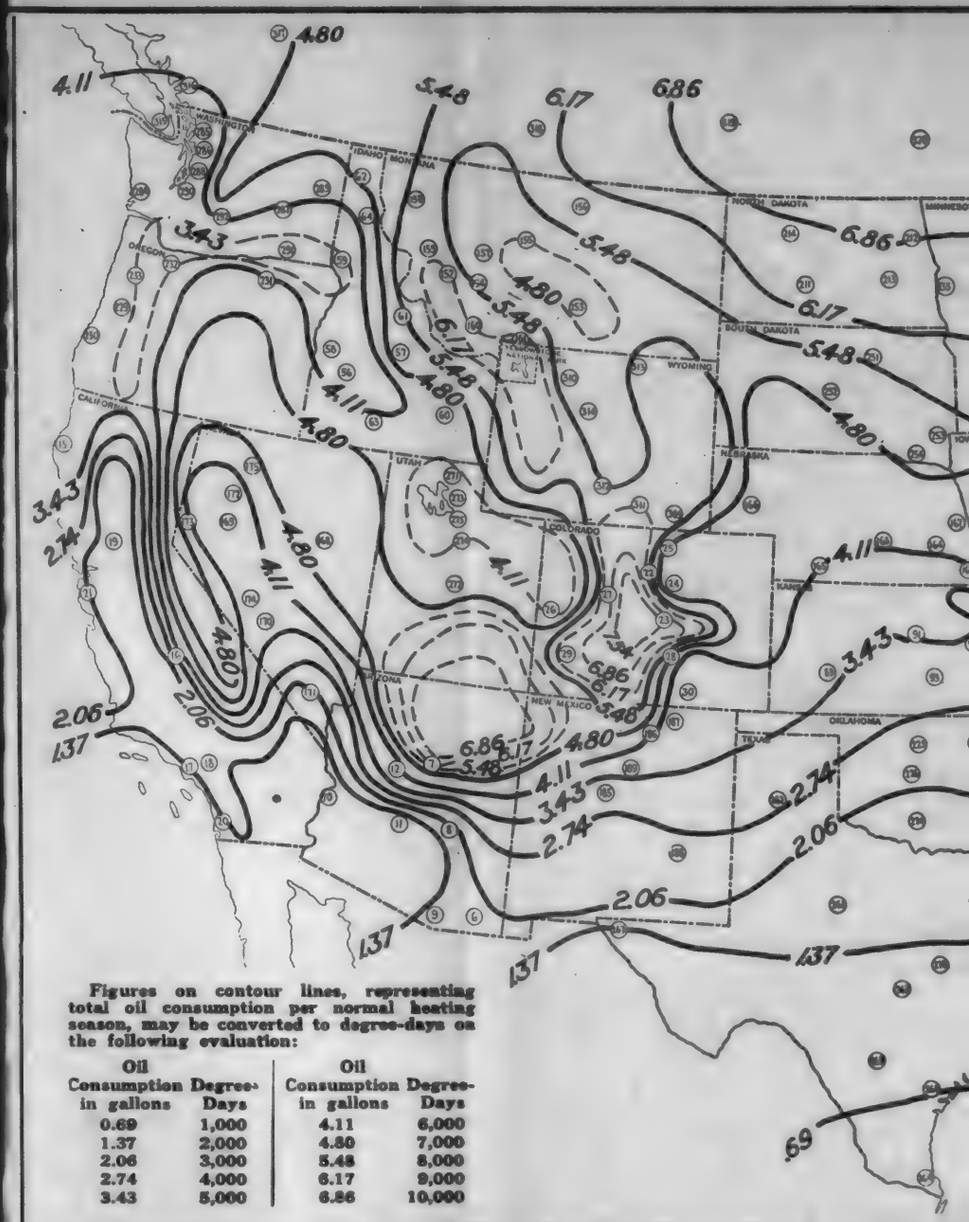
Oil Consumption in gallons	Degree-Days	Oil Consumption in gallons	Degree-Days
0.69	1,000	4.11	6,000
1.37	2,000	4.80	7,000
2.06	3,000	5.48	8,000
2.74	4,000	6.17	9,000
3.43	5,000	6.86	10,000

The general trend of the iso-degree-day lines throughout the eastern part of the country does not counter popular conception, but as soon as the eastern slope of the Rocky Mountains is approached, the influences of great natural factors is felt, and the failure of

The Iso-Oil-Con

To the end that there may be provided a simple and reasonably accurate method of determining oil requirements for domestic heating, the Iso-Oil-Consumption Chart has been developed from the Iso-Degree-Day Chart. The chart here presented is identical with the Iso-Degree-Day Chart, except that the degree-day figures have been replaced by figures representing the quantity of oil required to provide heat for 1 sq. ft. of steam radiation located on that line, based on certain assumptions.

It is assumed that the oil has a heating value of 140,000 B.T.U. per gallon. This figure was selected because, as a "round number," it represents the aver-



Figures on contour lines, representing total oil consumption per normal heating season, may be converted to degree-days on the following evaluation:

Oil Consumption in gallons	Degree-Days	Oil Consumption in gallons	Degree-Days
0.69	1,000	4.11	6,000
1.37	2,000	4.80	7,000
2.06	3,000	5.48	8,000
2.74	4,000	6.17	9,000
3.43	5,000	6.86	10,000

from data supplied by the Dominion Metereological Service.

The general trend of the iso-degree-day lines throughout the eastern part of the country does not counter popular conception, but as soon as the eastern slope of the Rocky Mountains is approached, the influences of great natural factors is felt, and the failure of the lines to follow the extension of their general mid-continent direction is disconcerting, to say the least.

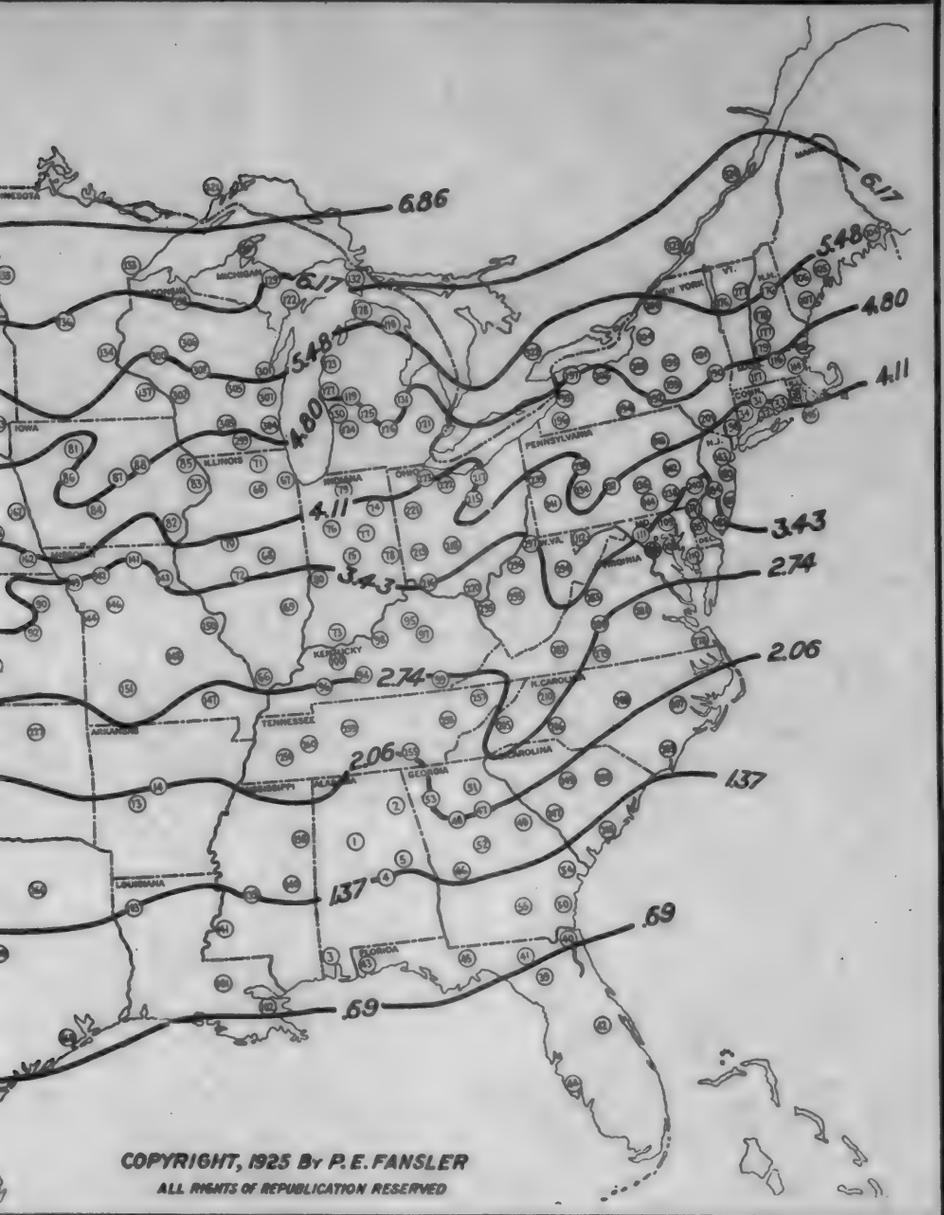
The iso-degree-day lines on both slopes of the western mountains have been so located that they follow very closely the actual climatic conditions resulting from the prevailing winds and topographic features of the region.

The Iso-Oil-Consumption Chart

To the end that there may be provided a simple and reasonably accurate method of determining oil requirements for domestic heating, the Iso-Oil-Consumption Chart has been developed from the Iso-Degree-Day Chart. The chart here presented is identical with the Iso-Degree-Day Chart, except that the degree-day figures have been replaced by figures representing the quantity of oil required to provide heat for 1 sq. ft. of steam radiation located on that line, based on certain assumptions.

It is assumed that the oil has a heating value of 140,000 B.T.U. per gallon. This figure was selected because, as a "round number," it represents the average analysis of domestic fuel sold throughout the United States. Oil quantities given on the chart may be corrected for any specific value of heat contents, by multiplying by the ratio of 140,000 to whatever heat value the oil in question may have. Thus, if we desire to determine the quantity of oil that would be required to accomplish a certain result in Kansas City, using oil having 136,000 B.T.U. per gallon, the quantity would obviously be the figure given on the chart, multiplied by 140,000/136,000.

It is assumed that the heating efficiency of the heating equipment is 100%. The figure is selected solely for ease of computation. Assumptions of efficiency



of a particular installation should be made with great care, inasmuch as oil-burners are frequently installed in old boilers or in boilers operating under unfavorable conditions, so that the total efficiency of the burner and boiler may not be over 35% or 40%. In the gas industry the situation is greatly simplified inasmuch as practically all installations of gas burners are made only in new gas boilers, working efficiencies of which are known to a high degree of accuracy.

It is doubtful if the *average annual heating efficiency* of a high-class installation, burning oil, may be safely taken at over 70%, and from 50% to 60% might cover the range except in unusual cases.

It is unfortunate that more data are not available giving the actual working efficiency of different types of boilers, operating under different conditions and burning oil. Such information is extremely difficult to obtain without material errors, and until such time as reasonably accurate averages, covering a large number of actual installations, are available, the solution of problems with this chart depends entirely upon good judgment in estimating the efficiency under which the installation will probably function. It must, however, be borne in mind that there is an undetermined relation between the efficiency figures that must be used with this chart and those given in the literature of boiler manufacturers. The economy figures given in their catalogs represent boiler performance at fixed loads, within a reasonable range above and below the normal boiler rating.

It is suggested that a real opportunity exists for the procurement of data determining these *seasonal* efficiencies for various types, ages and sizes of boilers and furnaces.

If we are able, by *assuming* an efficiency figure, to compute the fuel requirements for a given heating load; then conversely, *if we know the amount of fuel that was consumed* in supplying heat for a given radiation over a given heating load, we may determine the *actual working efficiency*. If such calculations are made with reasonable safeguards as to accuracy in assumptions and fundamental figures, we may arrive at *annual heating efficiency* figures, the accuracy of which, according to the law of averages, is proportional to the number of cases considered.

The samples are now in the hands of the Committee on Oil Burners, which committee is in charge of the Underwriters' regulations applying to such devices. The Inspection Department of St. Louis has already approved this material as superior to anything demanded in our regulations which call for wrought-iron pipe. We are just adopting the material as standard for all our installations.

The material costs a little bit more than wrought-iron pipe, perhaps 3 cents a foot. We will say we put in an average of 25 ft. on a job, for an inside tank—75 cents.

There is one bad feature about this material, one thing we are having trouble with. I am going to be very frank about that. We are having trouble getting a BX to put on 7/16-in. copper tubing which will go on there readily and can be taken out both rolls together, and then slipped in on the job. I am working right now with a couple of manufacturers of BX and it very probable that we will get them to wind BX covering right on the copper tubing at the factory. If we can do that, of course the material comes to us all made up, and not only to us, but I think it will open possibilities for oil piping all over the country. We can, however, get the ordinary ⅜-in. BX over the 7/16-in. tubing. What we are trying to get is a slightly oversize ⅜-in. We have found it from time to time. We find an isolated roll here or there. We are trying to get the oversized stuff as a standard product.

The armored tubing can be used with flange union at the tank valve and float chamber, and will thus leave only two joints in the entire oil line. When the demands in an industry have become sufficiently great, manufacturers have always been ready to make special equipment best suited to the particular needs of that industry. Very probably the burner industry is on the treshhold of such a position at the present time, and no doubt, manufacturers will before long begin making a material, perhaps not just like the one we are adopting, but nevertheless one which has the same desirable features and eliminates the shortcomings of steel piping for oil lines. Until such a material is offered, however, we believe that the combination we have devolved upon will satisfactorily fill the bill.

Organization of New York City Oil Burner Association

Oil burner men of New York have combined to combat the difficulties they are having in doing business under the present New York City fuel-oil rules and their enforcement. Permanent organization was effected at a meeting held October 20, at which the following officers were elected:

President, C. S. Winston, Cornell Utilities Co.; vice-president, E. G. Rhoades. Kleen-Heet Atlantic Corp.; secretary-treasurer, L. D. Becker, secretary, American Oil Burner Association; directors, G. W. Bohn, Preferred Utilities Co.; Bullock, Caloroil Burner Corp.; P. F. Hagen, Quinn Oil Burner Corp.; J. P. Leask, Peabody Engineering Corp.; C. N. Wheeler, Briggs Engineering Co.

At a preliminary meeting, held September 24, at the headquarters of the American Oil Burner Association, with Secretary Leod D. Becker as temporary chairman, it was voted to appoint a committee of five members to study the problem and make specific recommendations to a general meeting, to be held at a later date. Mr. Becker was named chairman. The other members of the committee, appointed by Mr. Becker, are: P. J. Hagan, Quinn Oil Burner Corporation; Gearge P. Kittell, Aeroil Burner Company; E. A. Pierce, Coloroil Burner Company, and C. S. Winston, Cornell Utilities Company.

In regard to the activities of this committee, the prospectus states that there are two separate and distinct problems to be considered, each having to do with a separate and distinct department of the local administration, namely:

Fuel-oil rules and regulations, as laid down by the Board of Standards and Appeals, "or whatever body may take its place in the near future."

Fuel-oil rules enforcement, which is under the jurisdiction of the Fire Prevention Bureau of the City of New York.

"There is no direct executive relationship," continues the prospectus, "between the Board and the Bureau except to the extent that the Board prescribes to the Bureau and also partly to the building departments, what to enforce, leaving the how entirely to the Bureau and the building departments.

"Our City Rules Committee's first effort should be to ascertain the exact legal status of both the Board and the Bureau, finding out under what charters, ordinances or statutes each one is operating. and how and by whom the several officials on these bodies are appointed or elected.

"The committee should also collect data which it may cite in support of the changes to be recommended. For instance, should a change in the present tank specification be desired, the committee should be able to substantiate the reason for such a change by reports from one or more authorities on the subject. All recommendation should be based absolutely on sound engineering principles, and the matter of safety

Convention Dinner of the American Nokol Company

should be as much of a concern to us as to anyone else.

"When this work is completed, the City Rules Committee should appoint or employ one person to confer with the chairman of the Board of Standards and Appeals, and other members of this board. A conference between board members and our committee may be arranged for if deemed advisable, and the co-operation of the city officials be invited to the greatest possible degree.

"In regard to the enforcement of the Fuel-Oil Rules, the committee should get in touch with the present heads of the bureau, Messrs. Hays and Spence, and seek radical relief. Future action would depend on the stand the Bureau Chiefs take. It is pointed out that in case satisfactory co-operation cannot be obtained by such a course of action, there is the possibility that relief may be had by taking a test case into court. Such a method does not appear to be possible in the case of the Board of Standards and Appeals with the possible exception of the approval of new devices submitted to the board."

New Jersey Oil Burner Association Urges Special Classification for Installation Men

A SPECIAL called meeting of the New Jersey Oil Burner Trade Association was held in Newark, October 20, for the purpose of discussing the best method of handling the increasingly annoying question of labor in connection with the installation of oil burners. Nearly fifty members were present, indicating the part that the association is playing in New Jersey.

Although differences of opinion and practice were expressed, it developed as the consensus of the meeting that official steps should be taken to secure from the national labor organizations such treatment as would recognize the installation men as a special class. The condition is brought about by the fact that a normal installation requires a small amount of work by common laborers, digging and setting tanks, a little bricklaying, frequently some concrete work, pipe fitting, tinsmithing and some work by the carpenter. It would be manifestly impossible to employ union labor on these jobs without greatly increasing the cost, and it has frequently been the practice to do this work after union hours, or on Sundays.

It was brought out at the meeting that this was a real problem, increasing in extent and gravity, and that the straightforward method of taking it up with the union federation would produce the only satisfactory and lasting results. This will be done by a committee. The association is also attacking some of the other problems of the industry, one of the most important being the development of a standard uniform ordinance covering oil burner installations, another being the classification of domestic oil fuels, in conjunction with the oil distributing agencies. The membership of the association has almost doubled in the last month, and it is expected that there will a hundred members on the rolls by the first of the year.

E. A. Robertson is president of the association, and W. P. Post, Jr., 395 Riverside Ave., Newark, secretary.

Supplementary List of Approved Oil Burners

The following additional oil burners, it is announced, have been "listed" by the National Board of Fire Underwriters:

Aladdin Models "G" and "H" Domestic Oil Burners. Aladdin Oil Burner Corp., 219 North Michigan Avenue, Chicago, Ill.

Mechanical draft oil burner with a. c. or d. c. electric-motor drive. Temperature Control—Automatic. Ignition—Gas pilot. Fuel—Distillate or fuel oils not heavier than 28° A.P.I. Fuel Feed—Suction from storage and warm-air installations. Marking: Model "G" or "H" on etched name plate mounted on base of burner.

Nu-Way "Type D" Domestic Oil Burner. Dooley & Braden Co., Mfr., 4520-22 Sixth Ave., Rock Island, Ill.

Mechanical draft oil burner with a. c. electric-motor drive. Temperature Control—Automatic with Honeywell Type B stack thermostat. Ignition—Gas pilot, electrically ignited. Fuel—Distillate or fuel oil not heavier than 28° A.P.I. Fuel Feed—Gravity from supply tank to constant level chamber on burner. Designed for hot-water, steam and hot-air installations.

Marking: "Type D" on name plate mounted on burner housing—"Type B" on Honeywell stack thermostat.

"Model W" Domestic Oil Burner. Wayne Tank & Pump Co., Mfr., Fort Wayne, Ind.

Mechanical draft oil burner with a. c. electric-motor drive. Temperature Control—Automatic. Ignition—Gas pilot. Fuel—Distillate or gas oil not heavier than 32° A.P.I. Fuel Feed—Suction from supply tank to pump chamber, pressure from pump to combustion chamber. Designed for hot-water, steam and hot-air installations. Marking: "Model W" on etched name plate attached to top of blower housing.

Oilheat "Type 0-45" Domestic Oil Burner. Oilheat Systems, Inc., Mfr., 7 E. 14th St., New York, N. Y.

Natural draft oil burner. Temperature control—Manual. Ignition—Manual. Fuel—Distillate or kerosene not heavier than 38° Baume. Fuel Feed—Gravity. Designed for hot water, steam, and hot-air installations having a minimum draft of not less than 1/10 in. water column. Marking: "Type 0-45" on burner castings and on etched name plate attached to top of control valve housing.

"Timkin Arrow" Domestic Oil Burner. Timkin Detroit Co., 100-400 Clark Ave., Detroit, Mich.

Mechanical draft oil burner with a-c electric motor drive. Temperature Control — Automatic. Ignition — Electric. Fuel—Kerosene or distillate of 35° to

Dinner of New Jersey Oil Burner Men, in Newark, N. J., October 20

45° A.P.I. Fuel Feed—from supply to float chamber by gravity or suction and from float chamber to combustion chamber by suction. Designed for hot-water, steam and hot-air installations. Marking: "Timkin-Arrow" on etched name plate attached to blower housing.

International "Model 5-A" Domestic Oil Burner. International Heating Co., Mfr., 115-19 S. 14th St., St. Louis, Mo.

Natural draft oil burner. Temperature Control—Manual. Ignition—Manual. Fuel—Distillate or kerosene not heavier than 38° A.P.I. Fuel Feed—Gravity. Designed for hot-water, steam, and hot-air installations having minimum draft not less than 0.1 in. water column. Marking: "Model 5-A" cast on manifold and on base plate of control valve stand.

New Publications

A.S.H. & V.E. Guide 1925-1926, being the fourth edition of this reference book, has been issued by the A.S.H. & V.E. through the Guide Publication Committee of which Perry West, New York, is chairman. The book has been considerably enlarged over previous editions and is by all odds the most ambitious and comprehensive volume the society has issued to date.

Entirely new data on heat losses from buildings have been contributed by Professor A. C. Willard. Systems and piping for steam heating are covered in a new chapter arranged by R. V. Frost. A new chapter on automatic temperature regulation has been written by Samuel R. Lewis. New material on water heating has been furnished by Professor F. E. Giesecke, embracing the data which have appeared in recent issues of THE HEATING AND VENTILATING MAGAZINE. In addition, each of the chapters in the heating section has been revised by the authors under the direction of Chairman West.

In the ventilation section an important chapter has been added by N. V. Hollister on cooling in air conditioning work. Also a chapter on air washers and filters sponsored by W. H. Carrier, is included, together with a new chapter on systems of ventilation, by Perry West, H. B. Hedges, G. E. Otis and A. J. Nesbitt. In this chapter are given, for the first time in the Guide, engineering data on dry-air filter systems.

A new index to the text section has been compiled and the book concludes with a roll of the society's membership. No less than 130 manufacturers of heating and ventilating equipment are represented in the catalog data section, the descriptions of the products being accompanied, in each case, by the necessary engineering data. Size 6 x 9 in. Pp. 584. Cloth. Price $3.00 postpaid. Published by the American Society of Heating and Ventilating Engineers, 29 West 39th Street, New York, or may be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE.

The Forthcoming National Heating and Ventilating Exposition

AS ANNOUNCED exclusively in THE HEATING AND VENTILATING MAGAZINE for March, 1925, the first National Heating and Ventilating Exposition is scheduled to be held in the new Madison Square Garden, New York, the first week in February, 1926. The date selected will immediately follow that of the annual meeting of the American Society of Heating and Ventilating Engineers, in Buffalo, N. Y., January 26-29, 1926.

In addition to heating and ventilating exhibits the exposition will include a plumbing and refrigeration display.

The show will be under the management of the National Exposition Company, Inc., Hotel McAlpin, New York.

Testimonial Dinner to William J. Woolley

On the occasion of the retirement of William J. Woolley as secretary-manager of the National Trade Extension Bureau, he was tendered a testimonial dinner at the Hadi Shrine Mosque in Evansville, by the entire staff of the bureau. The guests of honor were Mr. and Mrs. William J. Woolley and Mr. and Mrs. William G. Bergner, Mr. Bergner being Mr. Woolley's successor as secretary-manager of the bureau.

At the close of the dinner Mr. Woolley was presented with a copper-plate engraved testimonial scroll, expressing the regret of the bureau employes at the parting, coupled with good will and best wishes for Mr. Woolley's future success. This was signed by each one of the regular staff of the bureau.

The presentation was made by Howard E. Jones, director of the Sales-Help Service. E. L. Bowman, educational director of the Apprenticeship Department, on behalf of the entire organization, then presented Mr. Woolley with a traveling and desk clock.

In his response Mr. Woolley expressed his appreciation and made it evident that his leave-taking, as the active head of the bureau organization, was deeply touched with regret. He paid high tribute to the loyalty and intelligence with which the staff of the bureau had supported his management and gave the assurance that nothing but a real lifetime opportunity could ever have been the cause of his ever laying down the active direction of the bureau. (A later announcement stated that Mr. Woolley had been elected vice-president and a director of the Pierce, Butler & Pierce Mfg. Corporation of Syracuse, N. Y.).

Mr. Bergner also spoke, pledging himself to continuing and carrying out the policies of Mr. Wooley's management.

Three Days' Institute for Plumbing and Heating Industries

According to the preliminary announcement of the second annual three-day institute for the plumbing, heating and ventilating industries of Pennsylvania, which will be held at the Carnegie Institute of Technology, Schenley Park, Pittsburgh, November 17-19, special attention will be devoted to the subjects of boiler ratings and testing, chimney sizes and combustion. On the opening day Professor S. E. Dibble will deliver a lecture on boiler ratings, presenting information for the assistance of the contractor in picking out cast-iron boilers to do a specific amount of work. Professor Roy B. Ambrose will discuss boiler testing, showing the contractor exactly how cast-iron boilers are tested so that proper ratings can be obtained. A lecture on "Friction of Water," by Professor Harold S. Thomas, will be devoted to the question of how lengths of pipes, fittings and valves reduce the amount of water discharged. "Chimney Sizes," will be presented by Professor Thomas G. Estep, whose address will deal with the required chimney sizes and heights for different kinds of equipment where coal, gas and oil are burned.

Other subjects to be taken up at the later sessions will include "Contracts and Liens," and "Combustion." The speaker on "Combustion" will be Professor Estep. This lecture will deal with the conservation of fuel and will show the proper methods of getting the highest efficiency in burning oil, coal or gas. Another speaker on the program is Director F. C. Houghten of the A. S. H. & V. E. Research Laboratory who will talk on "Value of Research Work in the Plumbing Industry." A supplementary program has been arranged for women attending the institute.

Plumbing and Heating Salesmen Form National Association

WITH an initial membership of nearly 50 members, the National Association of Plumbing and Heating Salesmen was successfully launched at a convention and exhibition, held at the Hotel Martinique, New York, October 16-17. The formation of this new organization is the direct result of a movement initiated by the Association of Plumbing and Heating Salesmen of Greater New York.

In connection with its first convention, the organization committee arranged a program which indicates the scope of the movement and its serious purpose. President Harry Homer of the Association of Plumbing and Heating Salesmen, Chapter 1, New Jersey, welcomed the delegates at the opening session, October 16. He was followed by President John H. Taylor of the Association of Plumbing and Heating Salesmen, Chapter 2, New York.

Other speakers at this and succeeding sessions were Harvey A. Call, editor of *The Dotted Line*, who spoke on "The Salesmen's Part in the Coming Year;" A. J. Bailey, credit manager of the American Radiator Company, whose subject was "Credits and Selling;" L. C. Hart, New York district sales manager of Johns-Manville, Inc., New York, who discussed "Selling as a Profession," and former President Samuel F. Wilson, of the National Association of Master Plumbers.

At the same time the exhibit in quarters adjoining the convention hall proved a rendezvous for the "outside" convention. Among the exhibitors were the X Laboratories, Jersey City, N. J.; Excelso Specialty Works, Buffalo, N. Y.; Hoffman Specialty Co., Inc., New York; and the Dunham Co., Berea, O.

Permanent organization was effected at the Saturday morning session by the election of the following officers:

President, William G. Boales, Detroit, (Hoffman Specialty Co.); first vice-president, Edward J. Bredehoft, New York (Handon Boiler Corp.); second vice-president, W. H. Wanner, Portland, Ore.; secretary, William F. Weber, New York (Ideal Sales Co.); treasurer, Harry J. La Croix (Pittsburgh Water Heater Co.).

A salesmen's "Frolic and Smoker," which lived up to its title, was staged Friday night.

On Saturday night, over 100 members and guests gathered for a dinner dance at the Martinique which brought the convention to a close. After the dinner, dancing was in order. C. W. Farrar, vice-president of the Excelso Specialty Works, was the toastmaster.

The next convention will be held next May, probably in Detroit.

Winter Construction on the Increase

The building season is gradually being lengthened as the result of a drive undertaken by the Construction Industries in co-operation with the Department of Commerce. This fact has been established through a survey made by the Division of Building and Housing of the Department at the direction of Secretary Hoover to determine what results were being obtained. Reports from contractors in sixteen large cities show that payrolls and material purchases were relatively larger in the winter months of 1924 than in those of 1923. The 1923 figures in turn showed an increase over 1922. Payrolls and material bills are measures of building activity which follow actual work very closely.

The large number of contractors who answered the Department's inquiry gave figures showing for each month the percentage of the year's total. Practically all replies had the same trend, making an average a fair statement of conditions as given. Changes in general business conditions and a difference in the weather undoubtedly had some share in the result. But making allowance for such factors, a distinct improvement in the relative amount of winter building is apparent.

There are already favorable indications for the coming winter. The August figures for contracts awarded for all classes of construction have proved to be the highest ever known. Many of the operations represented by these contracts will undoubtedly be carried over into the cold weather.

All groups in the building industry are trying earnestly to bring about a more equal distribution of work throughout the year. Their efforts are bringing results. More and more people are becoming convinced that winter construction is both practical and economical. The growth of this belief is certain to result in steadier employment and more efficient construction service.

Notable Installation of Ozone Apparatus

One of the most notable and easily the largest installations of ozone apparatus ever made in connection with a heating and ventilation system has just been ordered for the new Madison Square Garden in New York. Controlled ozone generators, of the United States Ozone Company type, will be used in this structure to supply ozone to eight ventilating fans in the attic, furnishing the air to the arena, and to four ventilating fans in the basement, furnishing air to the exhibition rooms. In all, 500,000 cu. ft. of air will be ozonized per minute.

The equipment is designed to give a maximum ozone concentration of 0.1 parts per million and this supply can be decreased to 25% of this amount. The equipment will be phased with the ventilating fans whereby they will start automatically with the starting of the

Plumbing and Heating Salesmen and Guests at Their First Convention Dinner in New York, October 17.

fans. The control of the ozone concentration is from one central point in the fan control room on the arena floor.

The particular application of ozone in this case will be the deodorization of organic odors from the circus and animal quarters and the oxidization of harmful products of combustion of tobacco which cause discomfort.

Death of Thomas F. Manville

THOMAS FRANKLIN MANVILLE, for the past 25 years the directing head of Johns-Manville, Inc., New York, died in New York, October 19. He had lived to see the company become the world's largest producer and manufacturer of asbestos and was the directing mind in the building up of an outstanding organization fully capable of carrying on his plans and policies to even greater achievements. His brother H. E. Manville, who succeeded to the presidency of Johns-Manville, Incorporated, in 1924, was closely identified with him during this entire period and will continue to direct the policies of the organization.

In addition to chairman of the board of directors of Johns-Manville, Incorporated, the late Mr. Manville was president of the Arizona Asbestos Company, treasurer and director of the Asbestos Wood & Shingle Company, president and director of the Canadian Johns-Manville Company, director of The Fibre Corporation, director of the Fifth Avenue Bank, trustee of the Franklin Savings Bank, president of the board of trustees of the Fifth Avenue Hospital, and president and director of the Manville Securities Company. He was a member of the Bankers, Metropolitan and Union League Clubs, New York.

Death of Paul W. Blatchford

An old-time figure in the heating and plumbing supply trade passed on when Paul W. Blatchford, past president, and for 24 years secretary, of the Central Supply Association, died at his home in Oak Park, Ill., October 8. Mr. Blatchford was known and respected by thousands of men in the manufacturing and supply field as well as among contractors throughout the Middle West. Of an engaging personality and accurately informed on trade conditions and movements, his judgment was widely sought by his many associates.

As an expression of the high regard in which he was held by the members of the Central Supply Association, Mr. Blatchford was elected honorary president of the association at the time of his retirement as secretary in 1924.

Mr. Blatchford was 66 years old. He was a son of E. W. Blatchford, president of the old Chicago Shot Tower Company, and of E. W. Blatchford & Company. He served as president of the Central Supply Association during 1898-99 and was elected secretary in 1900, holding that office until 1924. He is survived by a widow, two sons and two daughters.

H. ROMEYN SMITH, president of H. Romeyn Smith, Inc., New York, died at his home in Dobbs Ferry, N. Y., September 23. Mr. Smith was for 15 years sales manager in the New York district for the Detroit Brass & Malleable Iron Works. He was 64 years old. He had been confined to his bed since December, 1924, with cancer. For many years Mr. Smith was connected with the Clayton & Lambert Mfg. Company and the A. D. Mfg. Company of Detroit, before he became associated with the Detroit Brass & Malleable Works. He leaves a widow and a brother.

New Apparatus and Appliances

The Thomas Stoker

Details now available of the design and construction of the Thomas stoker, for use in boilers or warm-air furnaces, bear out the unique character of this appliance as described by L. S. Shaw, of Cleveland, at the recent convention of the National District Heating Association. The stoker is manufactured by the Thomas Stoker Company, of Cleveland, and is distributed to the trade through the L. S. Shaw & Co., 5716 Euclid Avenue, Cleveland, O.

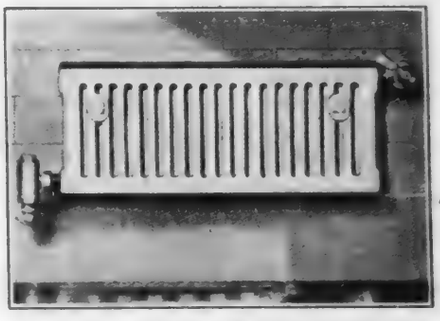
Thomas Stoker Installed in Warm-Air Furnace

The Thomas stoker operates on the underfeed principle. A plunger forces the fuel coal under the center of the fire, the number of its strokes varying as required. The fresh coal rises through a bed of white-hot coals. This causes the green coal to coke. It is then distributed around the center of the firepot in a manner to allow free circulation of air through the fuel bed. In this way it is possible to burn the smallest and cheapest coal sizes.

After the coal hopper (which is attached to the side of the appliance) is filled with coal, the feeding is automatic. Each stroke of the piston operating the plunger, it should be stated, also shakes the grate. Finally, thermostatic control is provided in the form of B and B thermostats and controls. These act to control the speed of the stoker, as well as to regulate the dampers of the furnace.

Peerless Bathroom Radiator

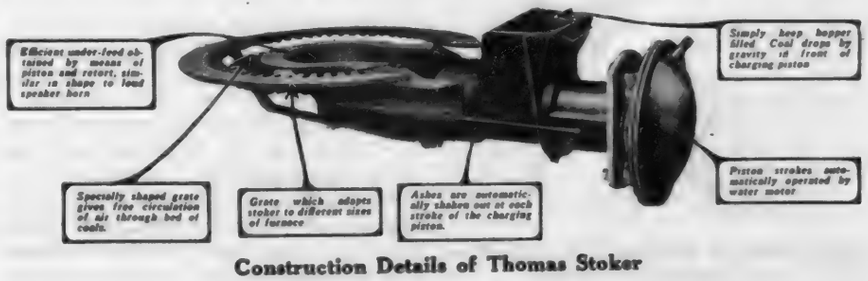
A new wall-type radiator has been brought out by the American Radiator Co., known as the Peerless bathroom radiator. It is designed particularly for installation in restricted spaces, such as below lavatories, where it may almost be tucked away out of sight. It is but 20 in. long, 8 in. high and 1½ in. deep, and has a heating capacity of 3½ sq. ft., ample for the average small bathroom. Two lag screws serve for attachment.



Peerless Bathroom Radiator

New Water Heater Design

The use of corrugated, instead of spiral, coils, is the principal feature of a new gas water heater brought out by


Efficient under-feed obtained by means of piston and retort, similar in shape to loud speaker horn
Simply keep hopper filled Coal drops by gravity in front of charging piston
Specially shaped grate gives free circulation of air through bed of coals.
Grate which adapts stoker to different sizes of furnace
Ashes are automatically shaken out at each stroke of the charging piston.
Piston strokes automatically operated by water motor

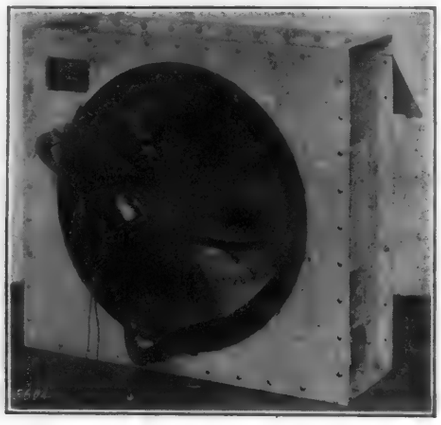
Construction Details of Thomas Stoker

the Dunham Co., Beria, O. It is known as the Bull's Eye water heater.

Both the water jacket and heat chamber are made of Dunite, a non-corrosive metal which the company has developed especially for this use. The heaters are made in a single size, capable of supplying tanks of 30 to 60 gal. capacity.

Sturtevant Manufactures Copper-Coil Unit Heater

An interesting addition to the B. F. Sturtevant line is the recently-announced Sturtevant unit heater, with extended-surface copper coils of the Aerofin type. The fan is the latest design of Sturtevant propeller, notable for its high efficiency. The heater utilizes copper tubing with extension ribs, and it is stated that 1 lin. ft. of this tubing is equal to 1 sq. ft. of cast-iron radiation, under similar conditions. Bulletin 323, just issued by the B. F. Sturtevant Co., Hyde Park, Boston, Mass., is devoted to this new product.

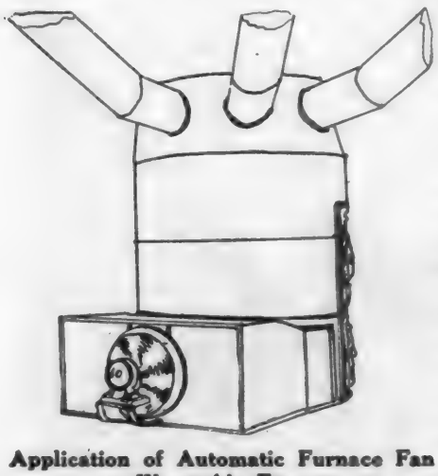


Sturtevant Unit Heater

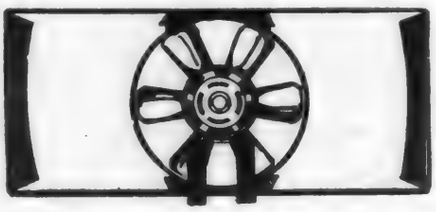
Automatic Furnace Fan

A warm-air furnace fan, for increasing the circulation of the heated air, has been placed upon the market by the Warm-Air Furnace Fan Co., 6523 Euclid Ave., Cleveland, O., under the trade name of the Automatic furnace fan. It operates on the positive pressure principle. As arranged, the fan orifice only is used for air supply when the fan is running. The automatic by-pass louvers are swung to a close position on each side of the fan orifice to prevent any possible back pressure leakage. When the fan is not in operation the warm-air circulation continues by gravity. In order to allow sufficient free area for gravity circulation, the louvers may be swung to a position parallel to the air flow. The louvers are balanced so that normally they are at an open position, but are actuated to close by the pressure which the fan builds up inside the furnace chamber.

In a descriptive catalog rules are given for calculating a fan furnace system based on the Mills rule.



Application of Automatic Furnace Fan to Warm-Air Furnace

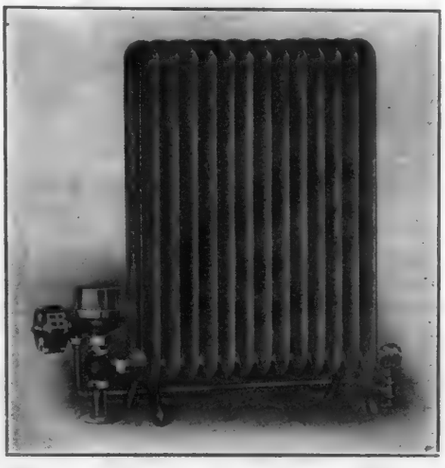


By-Pass Louvers of Automatic Furnace Fan Swung Open to Permit Gravity Circulation

McAlear Temperature Control Valve

The McAlear temperature control valve is designed for installation on radiators on new or old systems. This valve furnishes automatic control of temperature in a room by virtue of a duplex thermostatic valve element and temperature control element. The valve is made entirely of metal and consists of a series of thermostatic discs actuating a valve controlling the admission of steam to the radiator. A thermostatically operated valve controls the admission of steam to the chamber in which these thermostatic discs are contained. When the room temperature reaches the point at which the valve is set, the temperature control thermostat element expands, compressing a spring and opening a bypath valve which admits steam to the control chamber containing the thermostatic discs. The heating of these discs causes the radiator valve to close, against the action of a spring, thereby shutting off the steam supply to the radiator. When the room temperature drops below the point at which the radiator valve is set the control thermostat contracts, and the steam is shut off from the thermostatic discs in the control chamber. These cool, and the spring opens the valve, forcing the supply valve open, admitting steam to the radiator. Means are provided to keep the control chamber free from air and water. Means of adjustment are also incorporated so that the thermostat may be set for any desired room temperature.

With the McAlear control valve installed on radiators in an office building, if any room is to be unoccupied, the engineer, by simply moving the control to the "stop" point, the valve will remain closed until the room temperature reaches 40°, at which point it will automatically open and allow steam to again enter the radiator.

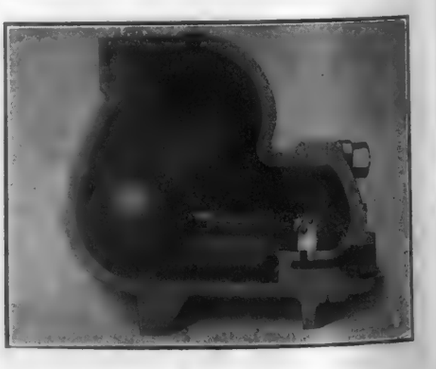


McAlear Temperature Control Valve Installed in a Two-Pipe Vacuum Heating System.

Paracoil Steam Trap Has Only One Moving Part

Simplicity is the keynote of the steam trap recently placed upon the market by the Davis Engineering Corporation, New York. This trap has been under test in various installations for nearly two years, and is now ready for general sale.

The valve is a portion of a sphere, rotating over a spherical seat, the valve being aluminum bronze. A portion of the sphere is recessed in such a way that the valve is opened through the rotation of the valve registering the recess with the hole in the seat. Thus the functioning of the valve keeps it constantly "seated." The lever arm is long, and, with a large unbalanced float, the action of the trap is positive and without drag. It is stated that the action of this trap is practically continuous, and this relieves the trap from hammer and excessive stresses resulting from intermittent action. Paracoil traps are manufactured for all pressures, but 30 lbs., 125 lbs. and 250 lbs. pressure are carried in stock.



Paracoil Steam Trap

New Trade Publications

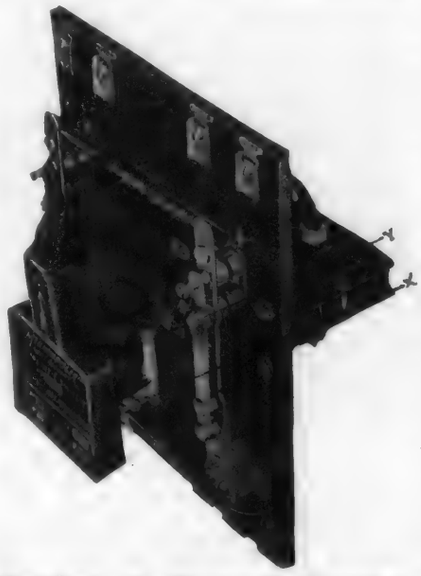
PROPERTIES OF STEEL FILLER RODS FOR GAS AND ELECTRIC WELDING is the subject of an interesting manual prepared by the Chicago Steel & Wire Co., 103rd Street and Torrence Avenue, Chicago, Ill., manufacturer of Weldite welding rods. The material in the booklet is practically all brand new and answers many questions which have perplexed welders. The properties of the rods are discussed for both gas and metallic arc welding. The manual starts out with a discussion of the definitions of iron and steel. This is followed by the method of manufacturing filler rods and the manufacturing differences between filler rods for gas and electric welding. The causes of weld failures is discussed, as well as gas in filler rods, the effect of water, heat treatment during manufacture of filler rods and general significance of chemical analysis. Various types of Weldite filler rods are presented, including Type No. 10 for oxy-acetylene or gas welding, which is described as especially adaptable for all production welding on mild steel, such as boilers, tanks, pipe line, etc. Size 4 x 9 in. Pp. 28.

FRANK WALL RADIATOR BRACKETS, including, in addition to standard types, legless types, steel expansion hook plates, steel hook plates and steel offset hook plates, are presented in a catalogue issued by the Frank Radiator Bracket Co., 30 North La Salle St., Chicago, Ill. The entire line is the invention of John C. Frank, an experienced steamfitter, which gives each product the vital quality of practicability. The units are notable for their strength, durability and simplicity of installation. Both horizontal and vertical adjustment is provided for. The expansion hook and steel hook plates are made of one piece of hot-rolled striped steel, without bolts or riveted parts. The spreader is also made of a single piece of steel, devoid of rivets or bolts. Included in the catalogue is a ceiling radiator hanger, with lock-tight combination nut and washer, doing away with pipe hangers and perforated strap iron at that point. Size 4 x 8½ in. Pp. 20.

FOXBORO BULLETIN No. 148, has just been received from the Foxboro Co., Inc., Foxboro, Mass. This describes the many types, sizes and ranges of indicating thermometers manufactured by this company, with prices, and all necessary information. Interesting suggestions of applications are made, and the catalog is well illustrated with photographs and drawings. Size 8½ x 11 in., Pp. 36.

AMES UNIT SYSTEM is the caption of a circular describing the unit system of fuel oil pumping, heating and straining, designed and manufactured by Ames Pump and Machinery Corporation, New York. This equipment has automatic temperature and pressure control, and is a very elaborate and well worked out unit for industrial applications.

SERIES 10 CONTROLS is the title of a new bulletin issued by the Minneapolis Heat Regulator Co., Minneapolis, Minn., describing in detail the new circuit for oil-burner control. This circuit involves the use of a double-arm room thermostat, with contacts placed on one side of the blades, instead of on opposite sides. There is an inherent tendency, in a two-wire circuit, for the contacts to "tremble" at the critical breaking



New Series 10 Minneapolis Control for Oil-Burner Operation

point, with the result that the contact may be made and broken several times with just enough interval to cause intermittent functioning of the burner until the contact finally settles to position. The new Series 10 circuit is designed to prevent this difficulty, and to secure a single make-or-break in each instance of thermostat functioning. The bulletin explains the new circuit and the modifications of the old Series 10 thermostat and relay that have been made. Size 8½ x 11 in. Pp. 12.

SMOKELESS COAL BURNING A FACT is the title of a folder received from the CombustiKator Co., Chicago. This is a well-illustrated four-page circular, showing the principle of application of the "combustiKator" to various types of boilers, together with photographs of actual installations, and numerous testimonial letters from satisfied users. The "combustiKator" can be installed in all standard fire-box boilers, by any heating contractor. It provides for the firing of coal and the production of gas therefrom, the gas being fired in the combustion chamber, and the coal being reduced to coke, which is then burned on the grate. The "combustiKator," therefore, is a combination of gas-producer and stoker. One illustration in the folder shows the new co-operative Sheridan-Brompton Apartment Building, Chicago, which will be heated by two Kewanee boilers fitted with "combustiKators." Size 8½ x 11 in. Pp. 4.

ALCLIN SLIDE RULE is illustrated and described in a little folder mailed by the General Heating Supply Co., Kansas City, Mo. This describes a special slide rule, designed to solve problems relating to heating. By the use of this rule, computations may be quickly made of direct radiation for all types of building construction, and for various temperature differences. In addition to the computation of radiation, the expansion of pipes may be figured, and the heating surface of pipes of any diameter or length.

AMERICAN BLOWER COMPANY is sending out bulletin No. 6103, describing the line of American H. S. single inlet fans, which line has recently been adapted to the ventilating field. The design contemplates high efficiency, the equal, practically, of the well-known Sirocco, and ability to operate at high speed, from which the designation "H. S." is taken. The bulletin incorporates specification sheets, standard arrangement, capacity tables and dimension sheets. The last page contains a list of both technical bulletins and bulletins covering special applications of American Blower products. Size 8½ x 11 in. Pp. 32.

DIVIDENDS FROM REED AIR is the title of a little folder sent out by Reed Air Filter Company, Louisville, Ky. This bulletin particularly portrays and describes the application of Reed air filters in Schrafft restaurants in New York City. Size 8½ x 11 in. Pp. 2.

CONVENIENCE-PLUS is the title of a little folder being distributed by McDonald & Miller, Chicago, Ill., describing their duplex water feeders. Photographs of installations are shown portraying this accessory attached to coal, oil and gas-fired boilers. It is pointed out that the water feeder is a preventive of many troubles in boiler operation because it eliminates the cause of most of the troubles—improper water-line.

KLEEN-HEET ARCHITECTURAL REFERENCE BOOK is the title of a publication issued by the Winslow Boiler and Engineering Co., Chicago, Ill. It is the purpose of this booklet to place before heating engineers and contractors the fundamentals of the two types of oil-burners, manufactured by this company. One, the fully automatic Kleen-Heet, is built

in three types and thirteen sizes primarily for domestic use. The other, the Winslow Industrial, is a manually-operated burner practically built to order for each particular installation. A very comprehensive discussion on combustion is followed by a chapter on boiler adaptability, and a third section discusses draft requirements. A complete oil-burner specification is presented, followed by detailed information regarding the Winslow industrial burner, and the book concludes with a complete classification of the domestic types, rated to handle from 300 to 5000 sq. ft. of steam radiation. Size 8½ x 11 in. Pp. 24.

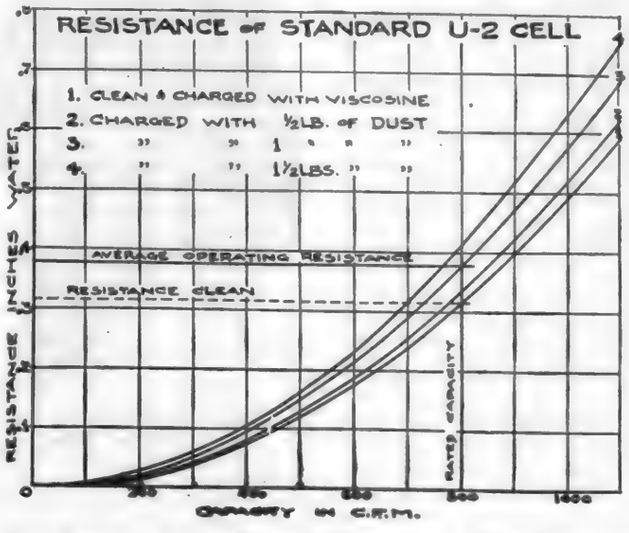
NOT LIKE OTHERS is the title of a little booklet sent out by the Pacific Gas Radiator Co., Los Angeles, Ca., descriptive of gas radiators and other products of this company. The gas radiators are, in reality, miniature warm-air furnaces, heated with a small gas-burner, and it is stated that over 150,000 are in use in Los Angeles and vicinity alone. They are made in sizes capable of supplying heat to enclosures from 1600 cu. ft. to 5600 cu. ft. The company also manufactures gas furnaces, consisting essentially of several units built on the order of the smaller gas radiators; all enclosed in a suitable insulated housing. While this product apparently is used almost exclusively on the Pacific coast, there would seem to be a large field, throughout the country, where gas is available, in heating bath rooms and other small rooms. Size 5 x 6 in. Pp. 16.

INDICATING THERMOMETERS is the title of a four-page bulletin issued by the Foxboro Co., Inc., Foxboro, Mass., describing briefly their indicating thermometers. This bulletin is only a portion of the literature covering the Foxboro indicating and recording instruments, and readers are invited, if interested, to send for the other, and more complete, literature.

GORTON SINGLE-PIPE VAPOR HEATING SYSTEM AND SPECIALTIES are described in a single sheet issued by Gorton & Lidgerwood Co., New York. This circular calls attention to the fact that the Gorton single-pipe vapor system uses the same pipe and the same piping as the ordinary one-pipe steam installation, employing only the special fittings and fixtures devised by the Gorton & Lidgerwood Company. Size 8½ x 11 in. Pp. 2.

PURDUE UNIVERSITY is the caption of an attractive folder being distributed by the Freeman-Riff Co., engineers and manufacturers of conveying machinery, Terre Haute, Ind. This folder calls attention to the new coal-handling, weighing and storing equipment, designed, manufactured and installed by the Freeman-Riff company, in the central heating and power plant at Purdue University, LaFayette, Indiana, and directs attention to the fact that the equipment was the selection of the engineering faculty. The folder shows, in a series of photographs, how coal, delivered in railroad cars, is dumped into a track hopper, fed therefrom by a double reciprocating plate-feeder to a single-roll crusher, and crushed to stoker size. It is then conveyed and elevated by a steel apron-conveyer and a continuous-type bucket-elevator to a steel flight-conveyor which distributes it into the suspension-type steel bunker. From the bunker, the coal is withdrawn, as required, into a weighing lorry, is weighed—the weight being recorded on reference cards—and is then fed to any desired stoker hopper. The bulletin emphasizes, with pictures, the salient points of this very complete equipment and concludes with a partial list of installations made in other notable plants.

CLEAN AIR IN BUILDING VENTILATION is the subject of a folder issued by the Midwest Air Filters, Inc., New York. The bulletin suggests some of the specific applications of Midwest air filters to the ventilation of buildings, and then describes in detail the Midwest principle. This is followed with a description of the new model type U2 Midwest air filter, and the book concludes with a list of outstanding Midwest installations. At the head of the bulletin is an interesting pair of pictures showing a Midwest air filter cell, installed in the New York Public Library, both before and after use. Size 8½ x 11 in. Pp. 4.


RESISTANCE of STANDARD U-2 CELL
1. CLEAN & CHARGED WITH VISCOSINE
2. CHARGED WITH ½LB. of DUST
3. " " 1 " "
4. " " 1½LBS. " "
AVERAGE OPERATING RESISTANCE
RESISTANCE CLEAN
RESISTANCE INCHES WATER
RATED CAPACITY
CAPACITY IN C.F.M.

Test Results of New Model Midwest Air Filter, Showing Resistances With Various Air Velocities

BOILER ROOM OPERATION is the title of a series of monthly bulletins to be issued by the Republic Flow Meters Co., Chicago, and are available upon request. As announced by the Republic Flow Meters Company, this series of articles will cover, in the next few issues: "Heat Losses," "Air for Combustion," "Heat Transmission in Steam Boilers," Boiler Efficiency" and "Preliminary Plant Survey."

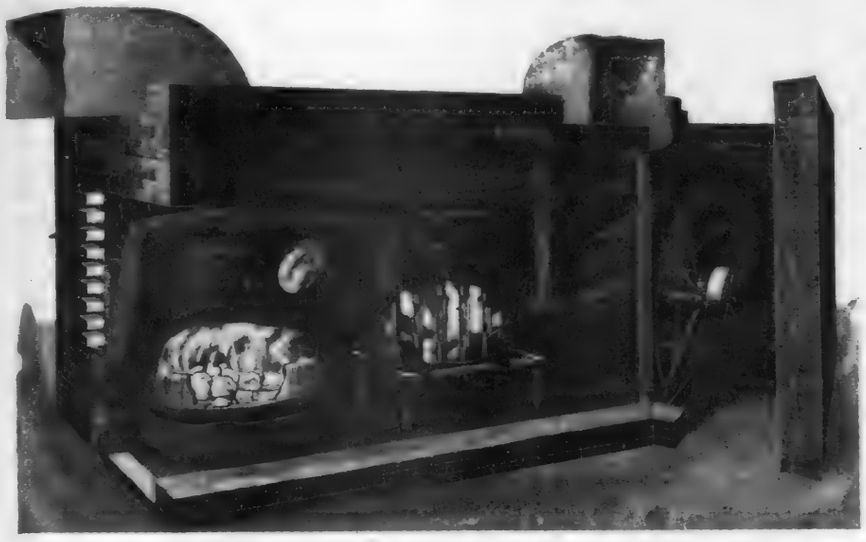
The author of the series on "Combustion" is Professor G. F. Gebhardt, for the past 25 years professor of mechanical engineering at Armour Institute of Technology, Chicago. The Republic Flow Meters Company is indeed fortunate in securing these articles from the pen of Professor Gebhardt, who is not only an authority in his field, but, through many contributions to the technical press and to scientific societies, is well known as a clear and forceful writer. In addition to this series of particular interest to the heating fraternity, parallel bulletins will be issued monthly, covering various stages of heat-treating, by Professor H. M. Boylston, head of the Metallurgical and Mining Engineering Department of Case School of Applied Science, Cleveland, O.

The third of the series, on "Ceramics," is by C. W. Parmelee, head of the Department of Ceramic Engineering, University of Illinois. It is, of course, the purpose of these monthly brochures to bring out the uses of Republic pyrometers, in various industries, but it is interesting to note, as an example of the high class of publicity work that is being done to-day, that no mention of, or reference to, Republic instruments is made in any of the articles.

THATCHER BOILERS, RADIATORS AND AUXILIARY EQUIPMENT are described and illustrated in a catalogue issued by the Thatcher Co., Newark, N. J. In a foreword, the attention of the reader is directed to the fact that the Thatcher Company still maintains their old standard of boiler rating, the figures given in each case being for cast-iron direct radiation, with average amount of surface in main risers and returns, allowed for. The company calls attention to the probability that adherence to this old custom of conservative rating, is responsible for an increase of over 200% in their business in the past two years. The catalogue lists a series of round boilers, and the well-known Thatcher sectional boilers fired from the front, as well as the Progress side-feed boiler.

The sections of this boiler are essentially triangular in shape, one leg being horizontal, one vertical and the third at an angle of about 30°, direct heat from the combustion chamber being applied at the lower part of the slanting leg. This design results in remarkably rapid steaming ability. The catalogue also lists the many accessories built by the Thatcher Company, and concludes with several pages of valuable technical information. Size 5 x 8 in. Pp. 80.

HEATING, VENTILATING, SUMMER COOLING, is the way the E. K. Campbell Heating Company, Kansas City, Mo., describes its fan system of heating and summer ventilation in a recently-published catalog. This system is designed especially for large spaces, using either



E. K. Campbell Steel-Plate Air Heater

E. K. Campbell steel-plate heaters or steam coils. What is described as the company's "summer breezes cooling system" is intended especially for such buildings as theatres, hotels and apartments. Air is removed by means of fans, driven either by electric motors or oil engines. As it is heated the air passes over the steel-plate heater or steam coils, and by a system of recircution the cold air is drawn off the floors and re-heated. Fresh air may be admitted to the fan for ventilation purposes as desired, and arrangements made for the removal through the ceiling of superheat and odors.

Moisture is supplied through an air moistener designed with sufficient capacity to furnish the required amount of water vapor. One of the principal talking points in favor of this system is its ability to heat large interiors quickly. An instance is cited of its bringing an interior of 80,000 cu. ft. from 52° up to 71° F. in 20 minutes.

Summer ventilation in churches is accomplished by running the fan faster, thus driving a larger volume at higher speed. In order to reduce the noise of operation to a minimum a special type of fan without metal housing is used and is incased in brick. The fans are of large capacity intended to run slowly. Size 7¾ x 10¾ in. Pp. 16.

Plumbing and Heating Trades in St. Louis Under Investigation

Two assistant attorneys-general, representing Attorney-General Otto of Missouri, have been assigned to conduct preliminary hearings to determine the nature of the activities of the St. Louis Master Plumbers' Association, the Journeymen Plumbers' Local Union No. 35, the St. Louis Heating and Piping Contractors' St. Louis Association and the Steamfitters' Union No. 552. The proceedings are considered unusual because the anti-trust laws have seldom been used as a basis for action against members of labor unions. The ordinary procedure is to invoke such laws in proceedings against employers' organizations only.

In complaints made by building owners, architects and general contractors, it is claimed that agreements between the masters' organizations and the journeymen's unions, together with agreements between both groups and supply houses, are contributing largely to the high building costs. No evidence has been shown, however, that written agreements exist between supply houses and the employers' organizations. The attorney-general claims that the written wage and working rules agreements between the master plumbers and the union indicate an accord between them which, he believes, can be shown as contributing to a combination in restraint of trade.

In the case against the Heating and Piping Contractors' Association a number of letters have been produced in an attempt to show that this organization had intended to engineer a boycott to force an independent dealer out of business although direct evidence to show that a boycott was actually undertaken still remains to be produced.

Dry Air Filters in Large Workroom

That the use of dry air filters in connection with the recirculation of air in a tool room, is not confined to small quarters, is evidenced in the accompanying illustration, which shows one of a number of units in a large plant in New England. An unusual amount of dust from grinding and buffing machines is liberated in this room and while most of it is exhausted through exhauster pipes, a considerable amount gets into the air which would prevent its re-circulation, unless effective means were taken to filter such dust.

How Dry Air Filters May be Utilited For Purifying Air in Large Workrooms

Present Accepted Practice in Domestic Oil Burners

11. Rayfield. *Atomizing, Pump Feed of Oil to Float Chamber, Atomization by Air Pressure Through Venturi.*

12. A. B. C. *Atomizing, Pump or Gravity Fuel Supply to Constant-level Chamber, and Suction to Atomizer Cup.*

Previous articles in this series are: July, 1925,—1. Kleen Heet, 2. Baker, 3. Kerrihard; August, 1925,—4. Silent Glow, 5. Aetna; September, 1925,—6. Caloroil, 7. Oil-O-Matic; October, 1925,—8. Chalmers, 9. Hart. 10, Sun.

11. Rayfield

DESIGNED by an engineer of high repute in the automotive field, the Rayfield oil-burner incorporates a number of interesting feaures. The unit consists of a motor, fan, rotary air pump and oil pump, all direct-connected on the same shaft. The oil pump draws oil from the main storage tank, no auxiliary tank or hand pump being required in connection with this burner. A suction strainer is on the intake line which strains all of the oil coming from the tank; an additional strainer is on the pressure side of the pump which again strains the oil which passes to the burner.

The rotary air pump compresses air exclusively for the purpose of breaking up the oil through the venturi tube. About 10 to 12 lbs. pressure is carried on the air line. The combustion air is furnished by a fan under the hood, and the amount of air passing into the boiler fire box is regulated by a valve which is automatically controlled by a thermostat located on the inside face of transite door. This control is self-adjusting, allowing the proper amount of air to enter the fire-box at all times.

The burner can operate on as low as ½ gal. of oil per hour or will burn a maximum amount of 3½ gal. per hour. The oil-control valve, located on the under side of the base in the pressure line, increases or decreases the amount of oil to be burned.

The oil flow into the burner is controlled by a lever and weight valve located under the hood. When the machine starts, it builds up the air pressure and raises the weight by means of the small diaphragm, opening the valve and allowing oil to pass into the venturi tube. If there are any air leaks the pressure will not build up; the lever will not raise, therefore, no oil can flow into the fire-box.

In other words, if the machine is not working properly no oil can flow into the fire-box. This is clearly and simply a safety device to guard against any possible shortcoming in the mechanism of the machine.

There is a lubricating oil pot under the base of the machine which holds sufficient oil to lubricate the compressor bearings for a full heating season.

When the machine starts, a 2-lb. air pressure is placed on the lubricating pot which pumps oil through small jets onto the rotor bearings. Any oil drippage from the bearings is caught in a small sump in the base of the machine, is drawn up through the intake pipe of the rotor and forced on through into the fire box and burned. This method of handling drip keeps the floor clean and free from grease.

The air furnished by the auxiliary fan cools the motor, then the air compressor and finally passes on into the fire-box for combustion purposes.

CONTROLS

Minneapolis Heat Regulator Company controls are used on all Rayfield installations. The type used is manufactured specially for this furnace and is not used on any other make of oil burner.

A Minneapolis Hydrostat is attached to all hot water jobs and on steam jobs a pressurestat is attached to the boiler and adjusted to start and stop the burner at any predetermined steam pressure, usually not to exceed 5 lbs.

The burner control is attached to the transite which goes over the fire-door opening. This control works a two-fold capacity in conjunction with a heat element located under the base of the machine.

If the burner starts and ignition should *not* take place the thermostat metal on the door would not expand, allowing the current to flow through the heating element under the base of the machine. This heating element is timed to operate in 120 seconds and will shut the burner down. On the other hand if the burner starts and ignition takes place promptly, as it should, the heating element on the door expands, cutting the current out of the control under the base of the machine which will allow the burner to operate until it is stopped by one of the other controls, either the thermostat or the boiler control. If the heating element for any cause should shut off the machine—it will be necessary to push on the button which comes through the opening in the heating element cover.

The other action of the heat control on the door is a safety measure only and operates as follows: If, for instance, while the burner is in operation, a fuse plug should burn out and this difficulty is discovered at once and a new plug inserted, the burner will not start

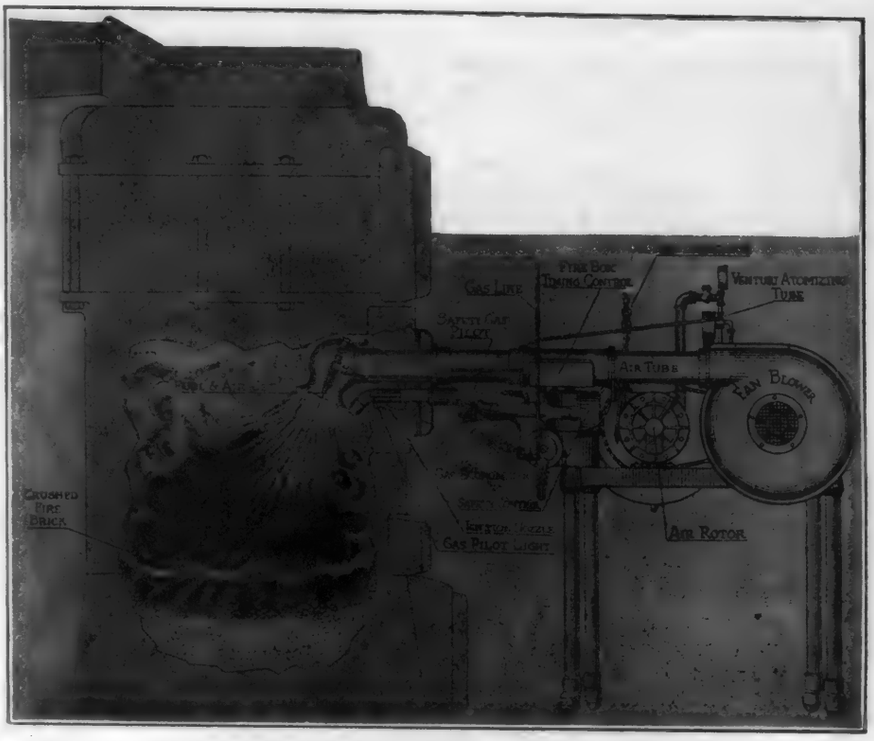
Installation of Rayfield Burner

until the boiler fire-box has cooled off to a point where it is safe to spray in oil. This safety device prevents the possibility of puff-backs or explosion, caused from throwing oil into a hot fire-box. This feature is exclusive with the Rayfield Burner.

The ignition spark is furnished by a transformer, doing away with vibrators and insuring a spark at all times. This spark is very hot and positive in its action. The electrode points are set far enough away from the end of the nozzle to prevent oil from striking them, preventing any possible chance of carbonizing. The spark is blown into the oil and air mixture in a "V"-shaped flame, causing instant ignition. The spark being continuous prevents the burner from stopping should there be a momentary cessation in the flow of oil, caused by air or water bubbles.

The electrodes are constructed from heavy nickel-silver wire and can be removed from the air tube by removing two brass nuts on the bakelite disc, located just outside of the transite door. The nozzle is located in the center of the bell-shaped auxiliary air ell. It has a series of air-cooling fins and the brass tip is adjusted to cause the oil flame to ignite about 2½ in. below the end.

Rayfield burners are designed for use with 28°-32° A.P.I. fuel, in four sizes, having rated capacities, respectively, of 1000, 3000, 6000, and 12,500 sq. ft. of steam radiation.



Schematic Arrangement of Rayfield Burner

12. A. B. C.

TO SEE an oil-fired boiler with no external evidence of the installation is so contrary to earlier practice in the industry that curiosity is invariably excited. In developing a burner to be set in the ash-pit of the ordinary boiler or furnace, the Automatic Burner Corporation, of Chicago, has evolved a distinctive type with a number of clever mechanical details. The burner is known as the "A. B. C." and is built to handle loads of direct steam equivalent radiation between 500 sq. ft. and 3,000 sq. ft.

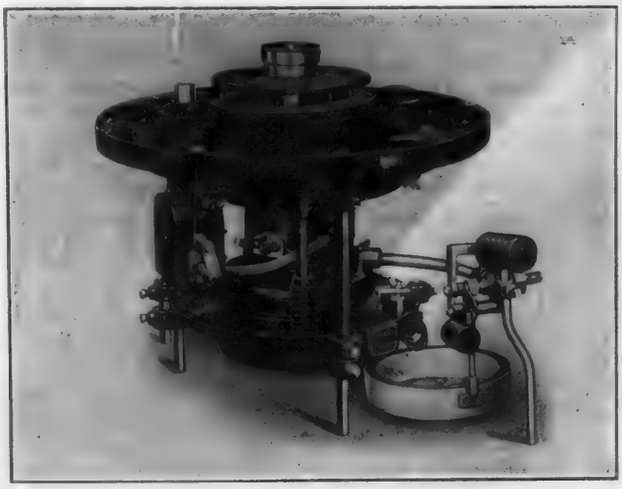
The burner consists essentially of a frame, a hearth plate, supporting the combustion bowl, an oil container, an electric motor, an atomizer, and an automatic gas pilot flame. The frame is a tripod, with adjustable legs, and carries the burner unit. The hearth plate is made in six sections, secured to the neck ring by screws, and sectionally built to permit introduction through small fire doors. The hearth plate carries the combustion bowl, which is molded in place, of crushed fire-brick surfaced with Plibrico. A special mechanism has been devised for rapid and accurate formation of the combustion bowl, and by its use any size between 18 in. diameter and 36 in. diameter may be constructed.

A.B.C. Motor with Atomizing Cup at Top, and Oil Container at Bottom

MOTOR CARRIES LITTLE LOAD

The motor is a series type, for use on either direct or alternating current, and designed to operate at 10,000 r.p.m. It is mounted with shaft vertical, and the armature is carried on two large sets of ball bearings. The shaft is hollow, the bore being slightly tapered, the smaller end being at the bottom. This end dips into an oil container, to which oil is supplied by gravity feed. A needle valve at the foot of the shaft controls the supply of oil.

The atomizer is mounted on the upper end of the motor shaft, and consists of a tapered cup, with sharp upper edge. The bottom of the cup is perforated to admit air from the ash-pit, this being the primary air supply. The cap covers the atomizer cup except for a small space around the periphery. The high speed at which this hollow shaft rotates produces, through the action of centrifugal force, enough lift to the oil in the container to raise it to the atomizing cup, at which point the enlargement and increased taper of the cup develops sufficient force to atomize the fuel through projection from the edge of the cup. The load on the motor is therefore almost negligible.



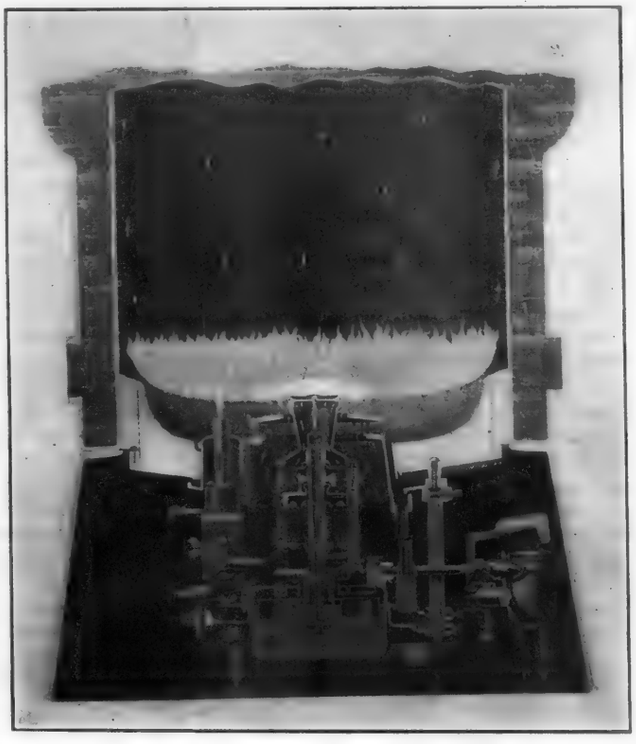
A.B.C. Burner

AIR HAS THREE PATHS OF ENTRY

An annular baffle plate is set somewhat below the top line of the atomizer cup, and through the surrounding space the secondary air is introduced. A reducer ring performs the double function of warming the incoming air by forcing it to enter over the top of the motor, and at the same time cools the motor. The baffle plate is set above the top of the neck ring, so that between them the air finds a third path to the flame. It is probable that this step-by-step introduction of air to the sheet of atomized oil is largely responsible for the quietness of the burner.

Using the same motor unit, two sizes of atomizer cups and two sizes of baffle plates, a wide range of capacity is secured by combining these with combustion bowls of different sizes.

Oil may be supplied to the oil container by gravity, from a service tank, or by means of an automatic pump. Control is conventional, from room thermostat, supported by a boiler control.



Cross Section of A.B.C. Burner

The A. B. C. burner is listed by the Underwriters to burn oil not heavier than 32° A.P.I., and the manufacturers further specify that it should not be lighter than 42° A.P.I., with a minimum flash test of 100° F.

Extensive Program of Oil Burner Industry

An ambitious program for the development of the activities of the American Oil Burner Association has been announced from the association headquarters at 350 Madison Avenue, New York. The program includes the establishment of a data file on everything relating to oil burning, including oil, burners and various equipment, and the collection and distribution of data on the testing of burners.

In addition, it is proposed to give descriptions of methods for taking flue and stack temperatures and for determining the percentage of carbon dioxide present, together with curves showing the relation between pounds of oil burned, percentage of carbon dioxide in flue gas, and temperature and amount of water evaporated.

It is also proposed to investigate burner design with reference to obtaining uniform flow to burner and feed to nozzles. The association will also make a study of the effect of velocity of winds, and drafts on the efficiency of burners, and will investigate the installation of economizers, study flame control, determine the efficiency of boilers and the possibilities of finding metals or alloys to withstand high temperatures.

Another movement involves the cooperation of the association with the oil industry in collecting data on tests and means of distribution of oils sold for burning. In this and similar activities the association will co operate with the National Fire Prevention Association and with the Underwriters' Laboratories. The association will continue work on research in radiant heat, and its uses for vaporizing oil fuels; better and more practical materials for screens, and possibilities of developing an inexpensive liquid soluble in oil and containing a large percentage of oxygen.

Night Air Mail Service

The fact that transmission of mail by air is effected in less than one-half the time required by train represents an achievement which, no doubt, will be taken advantage of generally by business men as they become more familiar with the Service. Air mail letters dispatched from New York today about 9 P. M. are delivered at their address in Chicago by first carrier delivery tomorrow morning; or, if forwarded from Chicago by train to other points, will move by the first morning train, instead of by a late evening train. The delivery of such letters in postal territory served from Chicago will thus be expedited by at least twelve hours and often much more.

A similar gain in time is made with respect to other air mail stations where mails are transferred to railroads for distribution in adjacent territory.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., for October 1, 1925.

State of New York, County of New York, ss:

Before me, a notary public in and for the State aforesaid, personally appeared Arthur S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the editor of The Heating and Ventilating Magazine, and that the following is, to the best of his knowledge and belief, a true statement of said publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form to wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are:

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York.

Editor, Arthur S. Armagnac, 1123 Broadway, New York.

Managing Editor, None.

Business Manager, Gustave Petersen, 1123 Broadway, New York.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the name and address of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Heating and Ventilating Magazine Co., 1123 Broadway, New York.

Arthur S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more or total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain, not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than of a bonafide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

ARTHUR S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 22nd day of September, 1925.

A. L. SCANTLEBURY.

Notary Public, Kings Co., No. 800.

Certificate filed in New York County, Clerk's No. 717.

New York County Register's No. 7596.

(My term expires March 30th, 1927.

Heating and Ventilating

Exp. IV.—*National Exposition of Power and Mechanical Engineering*—No. 3

The many new problems *in* Heating and Ventilating-

THE development of oil as a fuel for high and low pressure heating systems—the advantages of pulverized fuel—vacuum systems—unusual ventilating conditions and special conditioning systems—these and many other subjects of vital interest to those responsible for heating and ventilating, will be featured at the National Exposition of Power and Mechanical Engineering. And *in addition*—

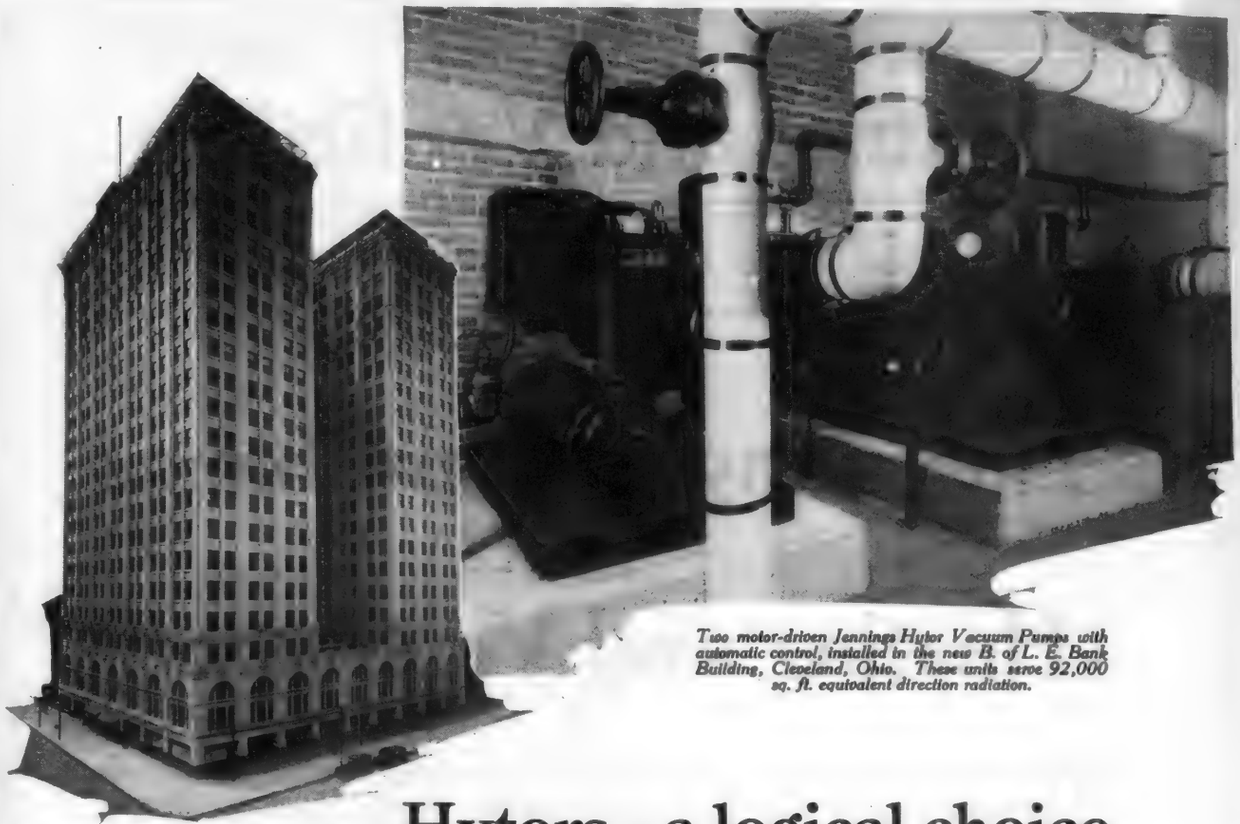
The 4th National Exposition of Power and Mechanical Engineering offers you the greatest possible source of modern ideas on power generation, transmission and utilization Enterprises concerned with power of any kind will be sure to benefit by the wide variety of interesting and educational exhibits displayed.

Be sure to attend this great Exposition and send one or more of your men to represent your firm. Let them meet and talk with the country's leading mechanical engineers, manufacturers and business men. No one can fail to bring back fresh ideas and information that will prove valuable business assets.

Make every effort to come in person and get your facts first hand. Plan *now* to be there.

National Exposition of Power and Mechanical Engineering

Grand Central Palace, New York City
NOVEMBER 30th to DECEMBER 5th



Two motor-driven Jennings Hytor Vacuum Pumps with automatic control, installed in the new B. of L. E. Bank Building, Cleveland, Ohio. These units serve 92,000 sq. ft. equivalent direction radiation.

This is the new Bank Building of the Brotherhood of Locomotive Engineers, Cleveland, Ohio. Mr. R. G. Naim, Engineer of Construction, Cleveland, Ohio.

Hytors—a logical choice for this up-to-date plant

Starting in 1920 with modest quarters, the labor bank of the Brotherhood of Locomotive Engineers, Cleveland, grew so rapidly that by 1925 larger facilities became necessary. As a result, the new 19-floor bank and office building, shown at left, was planned and built.

This building is up-to-date in every respect. Only the most improved equipment is installed for providing light, heat and power.

For removing the condensate and air from the exhaust steam heating system, Jennings Hytors were a logical choice. For in the many years they have been in use, Hytors have proved again and again that they can always be depended on for efficient trouble-free performance—the kind of performance that is indispensable in getting the best results in cooperation with other high grade equipment in the plant.

For complete information on Hytors and the uses for which they are recommended, write for our illustrated bulletins.

Nash Engineering Company

So. Norwalk Connecticut

Branch Sales Offices in: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington.

In Canada: Montreal, Toronto and Vancouver.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Coming Events

December 1-2, 1925.—Mid-year meeting of the National Warm-Air Heating and Ventilating Association, in Urbana, Ill.

November 30-December 4, 1925.—Forty-sixth annual meeting of the American Society of Mechanical Engineers, in New York. At least one of the sessions will be held jointly with that of the American Society of Refrigerating Engineers.

Miscellaneous Notes

American Society of Mechanical Engineers announces the election of William L. Abbott, chief operating engineer of the Commonwealth Edison Company, Chicago, Ill., as president for the ensuing year. Other officers elected are: Vice-presidents, Professor A. G. Christie, Baltimore, Md.; Professor William G. Magruder, Columbus, O.; Roy D. Wright, New York; managers: Professor Robert L. Daugherty, Pasadena, Cal., William Elmer, Altoona, Pa.; Charles E. Orcutt, New York City; treasurer, Eric Oberg, editor-in-chief of *Machinery*, New York. Delegates to American Engineering Council: William L. Abbott, John C. Faig, Arthur H. Greene, Jr., John L. Harrington, Ira N. Hollis, S. H. Libby, Dexter S. Kimball, William B. Powell and Hugh L. Thompson.

Ninth Annual Industrial and Safety Congress and Exhibit will be held in Syracuse, N. Y., November 30-December 3, with headquarters at the Hotel Onondaga. This congress and its exhibit are being conducted under the auspices of the New York State Department of Labor.

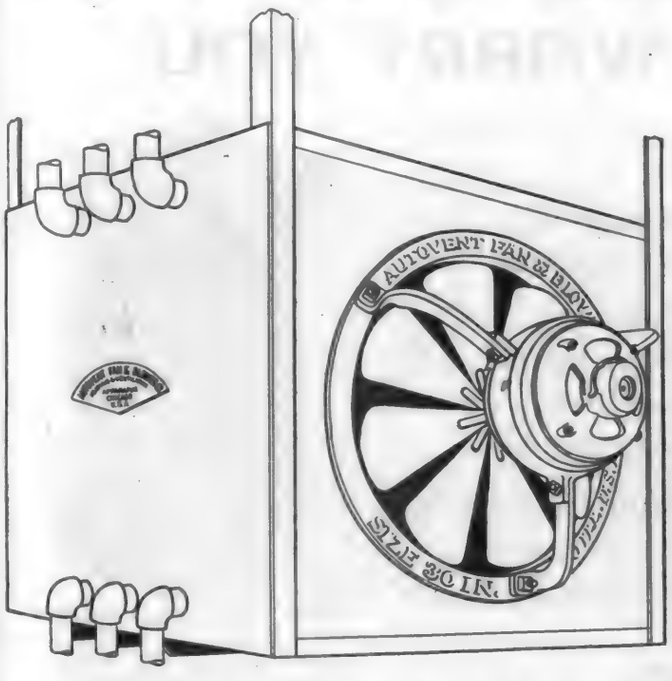
American Construction Council will hold its fourth annual meeting in Chicago, November 18-21, with headquarters at the Congress Hotel. As part of its annual meeting this year the council will conduct a national conference on better building. This will be a two days' session and will be attended from all parts of the country and Canada by representatives of various branches of the industry, including building investment, design, insurance, manufacturing, labor and public relations. This conference is designed to bring out the particular place that each branch of the industry holds in the entire problem of better building and its relation to the public. The third day of the council's meeting will begin with a general session on the reduction of construction peaks and depressions. There will also be a session on local building congresses and another session will be devoted to the place of commercial arbitration in the construction industry, with special reference to its national aspects.

American Welding Society held its annual Fall meeting in Cambridge, Mass., October 21-23, at the Massachusetts Institute of Technology. During the meeting a welding exposition was held at the Institute at which many applications of the welding process to materials used in heating work were demonstrated.

Eastern Supply Association held its annual meeting at the Hotel Astor, New York, October 14-15. Nearly 400 manufacturers and jobbers of heating and plumbing supplies were present. Among the subjects taken up, was a suggestion that certain sizes of wrought-iron pipes, cast-iron and malleable fittings, be discontinued such as sizes 4½, 7, 9, and 11 in. A resolution was adopted in favor of this suggestion. At the Thursday morning session Professor L. H. Heney, director of the Bureau of Business Research, New York University, spoke on the "Value of Statistics to

AUTOVENT UNIT HEATERS

CEILING TYPE



In addition to standard floor or pedestal types of heaters the Autovent Unit Heater shown to the left can in many instances be used to good advantage especially where floor space is not available.

Note the efficient Autovent fan used to induct the air into the unit at low velocity, expelling it at high velocity.

The motor on all types extends out of the cabinet. It is not in the path of the heated air, giving accessibility to both fan and motor.

Send for Engineering Data Book

AUTOVENT FAN & BLOWER COMPANY

730-738 W. Monroe Street CHICAGO

Trade Organizations." He characterized the collection of such statistics as the new science of business analysis and forecasting and urged the association to extend its activities in this direction. In the discussion of business conditions, at the concluding session, the reports were uniformly favorable. All of the officers were re-elected as follows:

President George E. Keenan; first vice-president, Philip J. Faherty, second vice-president, R. A. Tate; secretary and treasurer, Frank S. Hanley; members of board of directors, Martin Behrer, William A. Brecht, Willard Chamberlain, George L. Kumpf, James A. Messer, Leo M. O'Neill, James F. Sheppard, and A. A. Tomlinson. Claude M. Owen will represent the association in the National Chamber of Commerce, the associate representative being George N. Bridgman.

Dipl.-Ing. A. Margolis, representing Rud. Otto Meyer, of Hamburg, Germany, probably the most prominent concern in that country in the central station heating construction field, has been touring the United States, with a view of studying the methods followed in this country in the district heating field, especially in the use of exhaust steam and live steam. Mr. Margolis reports a large number of important projects under way in Germany, most of which, however, are planned to be operated as exhaust steam heating systems. Mr. Margolis was a recent visitor at the office of THE HEATING AND VENTILATING MAGAZINE. Before he returns to Germany he plans to visit Lockport, Buffalo, Cleveland, Grand Rapids, Chicago, St. Louis, Cincinnati, Pittsburgh and Philadelphia.

Japanese Industrial Leaders, it is reported, are now starting on a large scale of production of heating, lighting, water and sewer equipment of the sort to be found in American plants, according to William H. Smead, equipment engineer of the H. K. Ferguson Co., engineers and builders, Cleveland, O. Mr. Smead has just returned to Cleveland after having spent twenty months in charge of the manufacture and installation of equipment used in the new $10,000,000 plant of the Shebaura Engineering Works, in Tokio, designed and erected by the Ferguson Company. Practically all of the equipment which went into the plant sewer system, water lines, heating units, and lighting equipment was designed by Mr. Smead, manufactured in Japanese plants and installed with native labor. The work included the installation of a modern oil-burning plant, supplying steam for all steam-hammers, drying ovens, heating systems and hot water. The time is not far distant, according to Mr. Smead, when the manufacturing plants throughout Japan will have much the appearance of the best factories in this country. As this change takes place, Japanese goods in many lines, such as sewer pipe and the like, will find a large market in such countries as China and Russia.

New York's Eighth Annual "Own Your Home" Building and Equipment Exposition is scheduled to be held in the new Madison Square Garden, Eighth Avenue, 49th and 50th Streets, New York, February 20-27, 1926. Robert H. Sexton is managing director.

Chicago Heating and Piping Contractors' Association held its monthly dinner and meeting at the Hotel Sherman, October 29. The forty odd members present expressed considerable optimism relative to winter business.

C. V. Haynes, vice-president and general sales manager of the Hoffman Specialty Co., Inc., New York, gave a talk on "Heating," at the September meeting of the Master Plumbers' Association of Norfolk, Va.

Portland, Ore.—After 25 years of speculation, Portland will know in a comparatively short time if it is feasible to bore a traffic tube through Council Crest to connect the west side of the city, the business district, with the Tualatin Valley which lies less than three miles from the busiest corner. An election in connection with the proposition was to be held October 20. The project will involve an elaborate mechanical ventilation system.

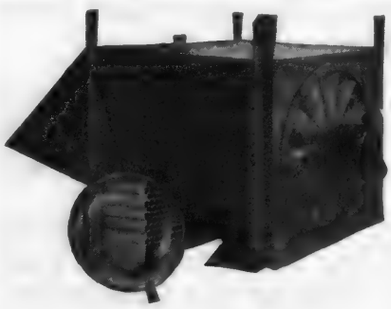
Building Operations for September, 1925, were the largest on record for September, according to the F. W. Dodge

WHY LET THAT UNHEATED BUILDING WORRY YOU

We manufacture Unit Heaters and Fan Heating Systems for every need. If steam is not available, our all steel direct fired Fan Furnace will meet your requirements.

Send us your heating problems and we will show you the easiest and cheapest way.

Recommendations and prices furnished cheerfully without cost to you.



COMET UNIT HEATER

Suitable for use where steam and hot water is available. This Heating Ace is especially adapted where compactness and lightness in weight is of importance. For complete description write for Bulletin No. 85.

DIRECT FIRED FAN FURNACE

For use where steam or hot water is not available. For complete data write for Bulletin No. 90.

THE NEW YORK BLOWER COMPANY

CHICAGO, ILL. *Branch Offices in Principal Cities* LA PORTE, IND.

Overcoming difficulties

WHERE working conditions have been most difficult, the merit of the Johns-Manville Underground System of Insulation has been most apparent.

Up hill and down dale, through congested city districts, over streams, through quicksand and through rock and in the face of many other obstacles, installations of the Johns-Manville System for preventing radiation and loss of heat from pipes running underground, have revealed its inherent high quality and the skill and ingenuity of the men who are responsible for its installation.

JOHNS-MANVILLE, Inc.
292 Madison Avenue at 41st Street, New York City
Branch in 64 Large Cities
For Canada: CANADIAN JOHNS-MANVILLE CO., Ltd.
Toronto

12-inch high pressure steam main and 8-inch return climb a steep hill. The grade was brought up to cover after the installation.

Like the New York Subway, the Johns-Manville Underground System of Insulation does not always stay underground. At Cornell University it crosses a creek.

Quicksand and numerous springs made trench digging difficult here.

Through—
Electrical Materials
FOR
Utilities
Jobber
Contractor
AND
Dealer

JOHNS-MANVILLE

Underground System of Insulation

Corporation's report for construction work started in that month. Building and engineering contracts awarded in the 36 Eastern States (which include about 7/8 of the total construction volume of the country) amounted to $581,216,700. This was only 7% under the high record figure of August, and it represented a 59% increase over September of last year. A seasonal decline of about 7% is customary in September.

The month's record included the following important items: $250,417,000, or 46% of all construction, for residential buildings; $80,171,800 or 15% for commercial buildings; $79,668,000, or 15% for public works and utilities; $43,297,700, or 8% for industrial buildings; and $35,217,300, or 6% for educational buildings.

In three big districts the construction volume of the past nine months has already exceeded the total construction volume of last year. These districts are New England, Pittsburgh District (Western Pennsylvania, West Virginia, Ohio and Kentucky) and the Central West (Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, Kansas, Oklahoma and Nebraska.) In the entire 36 States, the 9 months' volume is less than 4% behind the 1924 total and is greater than the total for any year previous to 1924. New construction started in the 36 States from January 1 to October 1 has amounted to $4,327,008,700, an increase of nearly 29% over the corresponding period of last year.

E. F. Glore, general sales manager of the Abram Cox Stove Co., Philadelphia, Pa., has been appointed chairman of Group No. 69 for the forthcoming Sesquicentennial International Exposition, to be held in Philadelphia next year. The title of this group is "Apparatus and Processes for Heating and Ventilation." It will consists of all forms of heating and ventilating, including plans, methods, equipment and the many accessories used. Manufacturers desiring to arrange for exhibits of their products at the Sesquicentennial Exposition, in this group, can obtain further data by addressing E. F. Glore, care of Abram Cox Stove Co., American and Dauphin Streets, Philadelphia. Work on the exposition, it is reported, is proceeding rapidly.

Manufacturers' Notes

American Schaeffer & Budenberg Corporation, Brooklyn, New York, announces that it has decided to re-establish its New England sales office in downtown Boston. Quarters have been taken in the new Chamber of Commerce Building, 60 Federal Street, with U. H. Nickerson in charge, as heretofore. Coincident with this change the company is transferring its Boston plant to Worcester where improved facilities are available. All stock will be maintained at Worcester and deliveries in Boston and throughout New England will be handled from that point.

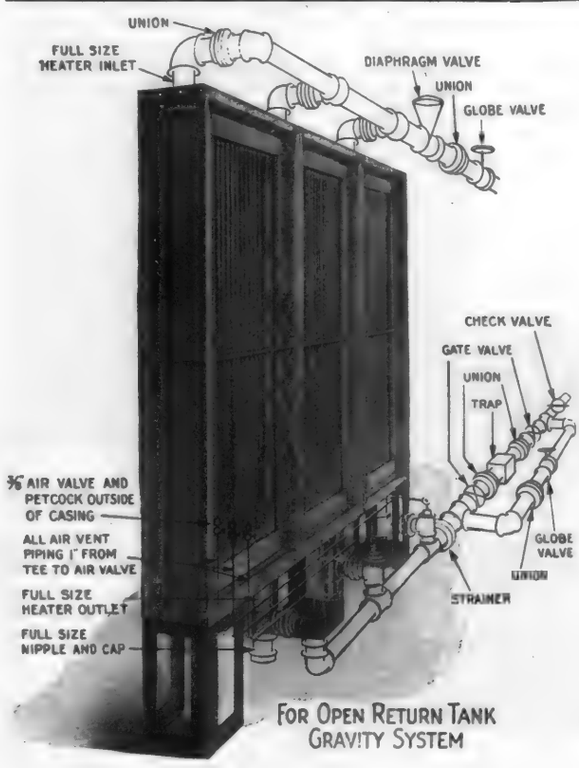
National Radiator Co., New Castle, Pa., is building a new boiler foundry in addition to its plant in New Castle.

John Simmons Co., 110 Center Street, New York, has taken over a new building in Long Island City where it has established a depot from which to distribute material to the heating and plumbing contractors of the metropolitan district. The new building adjoins the company's pipe yard at Nelson Avenue, Manley, Orton and Annable Streets, Long Island City, and contains approximately 80,000 sq. ft. The building is six stories high. It contains loading platforms where twelve trucks can be handled at a time, four under cover and behind locked doors. This will enable the delivery department to load four trucks after delivery hours, ready for movement early the next morning. Included in the equipment is a chute from the fourth to the first floor, down which material can be delivered to the loading platform.

Illinois Engineering Co., Chicago, Ill., has appointed the Paul B. Huyette Co., 5 South 18th Street, Philadelphia, as its representatives in the Philadelphia district.

Commonwealth Brass Corporation, Detroit, Mich., announces that Leavitt J. Bulkley has been elected secretary and treasurer of the corporation.

Bell & Gossett Co., Chicago, Ill., announces the completion of its new office, factory and warehouse at 3000-3002



FOR OPEN RETURN TANK GRAVITY SYSTEM

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Sales Manager*

AEROFIN

Fan-System Heating Surface

To Engineers, Architects and Contractors

THREE YEARS OF SUCCESSFUL SERVICE demonstrates that AEROFIN has established itself as a dependable product.

ENGINEERS OF NATIONAL REPUTATION AND TWENTY YEARS' EXPERIENCE WITH FAN SYSTEM HEATERS, are responsible for the design, development, manufacture and marketing of AEROFIN, and their services are at your command to assist you in working out your heating, ventilating, cooling and drying problems.

SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? Plans and specifications should show sizes and number of units, with piping details.

AEROFIN HAS A TREMENDOUS ADVANTAGE in its LIGHTWEIGHT. AEROFIN weighs only 9% to 25% as much as the old-fashioned heavy heaters. AEROFIN SAVES A GREAT DEAL OF SPACE.

AEROFIN IS MADE OF NON-CORROSIVE METALS. This feature meets with universal approval.

THE INSTALLED COST OF AEROFIN IS GENERALLY LESS than that of cast-iron heaters and pipe coils. AEROFIN (completely encased) can be erected in the same number of HOURS as is required in DAYS to erect the heavy heaters. This means a great saving in erecting cost.

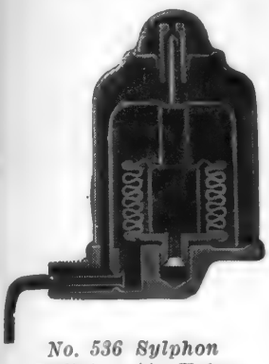
THE INSTALLATION OF AEROFIN WITH VERTICAL TUBES IS RECOMMENDED as this arrangement is less subject to errors of installation and operation. THE HORIZONTAL TUBE ARRANGEMENT is satisfactory when installed in accordance with our instructions and diagrams.

Write for catalog, instruction leaflet and service details.

Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

4 Sylphon VENT VALVES

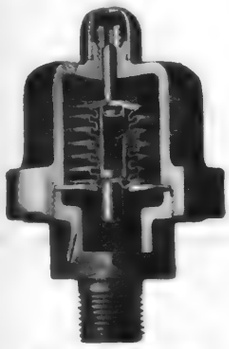
that make Radiators warm up quickly



No. 536 Sylphon Radiator Air Valve

NO ONE can expect a low pressure steam heating system to function properly if there is unvented air in radiators or piping. It is bound to hold back the steam. Small, weak air valves may work for a time, but they are sure to cease functioning soon.

A vent valve to function properly and last must have a strong thermostat and one that is flexible and has a large extent of movement. The Sylphon line of vent valves all contain the Sylphon bellows as thermostat. Known to heating experts as the most flexible, yet durable, expansion element in existence. Specify these valves and you assure a properly vented heating system for all time.

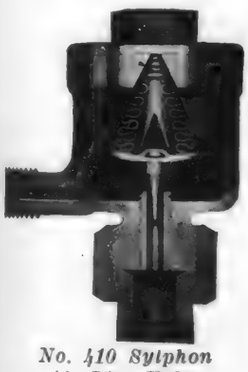


No. 527 Sylphon Quick Vent Valve

No. 536 Sylphon Radiator Air Valve. Large orifice assures free venting of air. Large buoyant bell float prevents escape of water of condensation. Large strong Sylphon bellows guarantees positive closing against escape of steam. Radiator connection 1/8-inch iron pipe size. 1 3/4-inch in diameter by 3 inches high. List price $2.00.

No. 527 Sylphon Quick Vent Valve. Installed on mains, risers and ends of long runs of pipe will positively vent all air and help No. 536 to produce hot radiators with surprising quickness. Contains large Sylphon bellows. Orifice 3/32 inch in diameter. Valve connection 3/8-inch pipe thread. 2 5/16 inches in diameter by 3 5/16 inches high. List price $3.00.

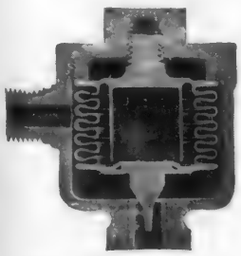
No. 410 Sylphon Air Line Valve. Installed on the radiators of air-line systems, will positively and silently expel air and condensation, but close against steam escape. Contains strong Sylphon bellows with large movement. Ruggedly constructed. All parts are cast brass. List price $4.50.



No. 410 Sylphon Air Line Valve

No. 510 Sylphon Quick Vent Valve for primary coils. Vents air from large heating coils used in stacks and in indirect heating with blowers where low pressure steam is used. Contains a powerful Sylphon bellows. Vent port 3/16 inch in diameter. Connection 3/8-inch pipe size. 1 15/16 inches in diameter by 2 9/16 inches high. List price $3.00.

Ask for Bulletin KAV



No. 510 Sylphon Quick Vent Valve

Every genuine Sylphon bellows is drawn and formed seamless from a flat sheet of specially prepared metal, with folds or corrugations formed to provide the greatest strength and flexibility.

This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL SEAMLESS SYLPHON BELLOWS
Sylphon

Diagrammatic cut shows extreme sensitiveness and extent of movement of the Sylphon bellows used as thermostatic element in all Sylphon heating specialties.

Breakdown, so common with the ordinary type of thermostat, is eliminated for neither years of constant use nor the powerful action of steam weaken the Sylphon bellows.

THE FULTON COMPANY, KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales Offices in: NEW YORK, CHICAGO, DETROIT, BOSTON, PHILADELPHIA and all the principal cities in U. S.

European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley St., London, W. 1, England

Canadian Representatives: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada.

Wallace Street, Chicago, Ill. The building contains the company's office, engineering, manufacturing and shipping departments and is especially designed to co-ordinate the work of these departments.

Walworth Mfg. Corp., Boston, Mass., announces that at a meeting of its stockholders, September 29, approval was given to the plan for the purchase of the Kelly & Jones Company, of Pittsburgh.

Duriron Co., Inc., Dayton, O., announces the appointment of John C. Candler as its representative to cover the State of Georgia. Mr. Candler will maintain headquarters at 315 Glenn Building, Atlanta.

Robert June Engineering Management Organization, Detroit, Mich., has acquired control of the Electric Flow Meter Company, Kansas City, Mo., formerly the Hyperbo-Electric Flow Meter Company, of Chicago, and will henceforth operate the business under its own management, with executive offices at 8835 Linwood Avenue, Detroit, Mich. The new officers of the company are: President, Robert June; vice-president, J. M. Naiman, formerly general manager; treasurer, Major W. W. Burden.

Johns-Manville, Inc., New York, has appointed Luther B. McMillan chief engineer in the department of engineering and research.

Everhot Heater Co., Detroit, Mich., manufacturer of the Everhot automatic water heaters, announces the appointment of Walter I. Vallett as eastern sales manager, to have charge of all of New England, New York State, Pennsylvania, New Jersey, Maryland and Delaware. Another appointment announced by the company is that of T. D. Buckwell as western sales manager, with headquarters at 612 Black Building, Los Angeles, Cal. Mr. Buckwell has for some years been the company's distributor for central Illinois with headquarters in Peoria.

Crane Co., Chicago, Ill., opened its national exhibit rooms in Atlantic City,

SEE OUR DETAILED DATA IN ASH&VE GUIDE

Boston Buffalo Chicago New York Philadelphia Los Angeles

THEODORE ROOSEVELT HIGH SCHOOL
OAKLAND, CALIF.

C. W. DICKEY
Architect

ATKINS AND PARKER
SAN FRANCISCO
Engineers

U. S. CONTROLLED OZONIZERS
Purifying 35,000 CFM. of air

We maintain our own Research Laboratories and Engineering Staff. Technical publications on OZONE air conditioning and water purification sent on request.

MONTGOMERY BROTHERS

CHICAGO
1020 SO. WABASH AVENUE

SAN FRANCISCO
61 FREMONT STREET

NEW YORK
50 CHURCH STREET

General Sales Agents for
THE UNITED STATES OZONE COMPANY
SCOTTDALE, PENNA.

A twist of the wrist

THAT literally is all it takes to eliminate sags in any pipe line when Grinnell Adjustable Hangers are used. You can forestall endless trouble and expense with a trifling extra first cost that is quickly returned by labor savings in installation.

The thousands of miles of pipe we have installed in other people's buildings have set a standard for low maintenance. Grinnell Adjustable Hangers and super-quality cast iron fittings are responsible. Both can be purchased on the market.

Send for our free 120-page catalogue. And, if your jobber doesn't stock Grinnell Hangers, ask us for the name of the nearest distributor. Address Grinnell Co., Inc., 280 W. Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending
Welding, Piping Supplies, etc.

September 15, when some 2,000 visitors were on hand to participate in the opening exercises. President R. T. Crane, Jr., of the Crane Company, made a special trip from Chicago in his private car to be present. Other officials of the company on hand were W. K. Glenn, advertising manager; Charles D. Fry, M. D. Robinson, H. Hounslea, J. S. Smart, T. H. Dawson, Jr., and K. V. Cramer. The exhibit, which is one of the most elaborate of its kind in the country, includes a mammoth valve located at the entrance to the exhibit building which serves as a huge door. The valve is one of the largest ever cast and the work involved in its transportation and setting up attracted widespread interest. Inside the exhibit hall the fixtures include marble and sunken baths and gold and silver-plated fittings. A large portion of the basement is devoted to a display of heating apparatus and appliances. J. W. Misener was in charge of the opening program, assisted by R. B. Scull, W. T. Smith, William Muldoon and K. Turner, of the company's sales force; also William Skidmore of the Harlem branch, William Boyne of the Buffalo branch, T. Hopkins of the Pittsburgh branch and Robert Hughes of the Camden branch.

Illinois Engineering Co., Chicago, Ill., announces the opening of a branch office in Cincinnati, O., in charge of F. E. Hutchen. The address is 141 East 4th Street. Mr. Hutchen was formerly manager of the heating department of the Van Camp Hardware & Iron Company.

Monarch Metal Products Co., St. Louis, Mo., announces the appointment of Charles G. Buder as assistant sales manager.

Pierce, Butler & Pierce Mfg. Corp., New York, announces the election of William J. Woolley as vice-president and director of the company, as well as of the Wolff Manufacturing Company of Chicago. Mr. Woolley, who was formerly manager of the National Trade Extension Bureau, will make his headquarters in Chicago.

Peerless Unit Ventilation Co., Inc., Long Island City, has appointed H. J. Reeves as its New England representative, with headquarters at 196 Worthington Street, Springfield, Mass. Mr. Reeves was formerly connected with the W. G. Cornell Company.

Air Preheater Corporation, 25 Broadway, New York, manufacturer of the Ljungstrom air preheater, is a consolidation of the James Howden & Company of America, Inc., and the Ljungstrom interests of Stockholm, Sweden. The newly-formed corporation takes over all Ljungstrom patent rights of the preheater, together with the shops of the James Howden & Company of America, Inc., at Wellsville, N. Y. B. C. Brolinson has been elected president of the Air Preheater Corporation. W. L. Batt, president of S K F Industries, is chairman of the board of directors. The corporation has orders on its books for approximately one million dollars for Ljungstrom air preheaters. These orders have been placed by many large utility and industrial companies.

Abram Cox Stove Co., Philadelphia, Pa., one of the oldest concerns engaged in the manufacturing of heating and cooking appliances, recently completed plans to enlarge its Lansdale plant and to move the machinery and equipment from the Philadelphia factory to Lansdale, Pa., twenty-five miles north of Philadelphia. The company believes that by concentrating the manufacturing at one place, and by increasing the size of the Lansdale plant, it will be in a better position to meet the increased demand for Novelty products. Work already has been started on the buildings and the change is to be completed by January 1, 1926.

This move enables the company to have more warehouse space for Philadelphia business. The five-story factory in Philadelphia will be converted into a large warehouse with over 300,000 sq. ft. of storage space where a complete stock of Novelty heating appliances will be stored for Philadelphia distribution. The general offices and showroom will remain at American and Dauphin Streets.

It is estimated that over 300,000 Philadelphia and suburban homes are equipped with some heating or cooking appliance manufactured by this firm.

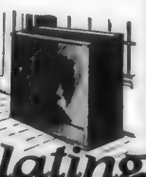
PEERVENT

The latest improvement in Heating and Ventilating Units, equipped with our new Peerfin Radiator. Write for information.

PEERLESS UNIT VENTILATION CO., INC.

SKILLMAN AVENUE AND HULST STREET
LONG ISLAND CITY, NEW YORK

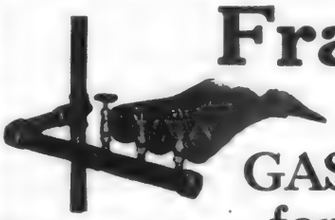
PEERLESS



UNIT SYSTEM

Heating and Ventilating

Franklin



No. 3 System without Thermo Valve and By-Pass

New Improved Quick Removable

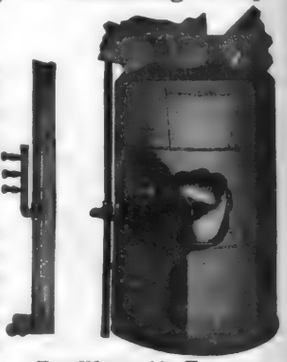
GAS BURNER for Economy

Every home owner is interested in a more economical and cleaner way of heating his home.

The FRANKLIN New Improved Quick Removable Gas Burner solves the problem. It eliminates the necessity of installing a separate new gas furnace.

If coal fire is desired, the Franklin Burner can be removed in a minute without tools, and can be reinstalled just as quickly.

The Franklin Burner is economical because it is properly constructed and scientifically correct. Thousands of users throughout the country heartily endorse the Franklin Gas Burner.



For Warm Air Furnace
Made also for Water or Steam

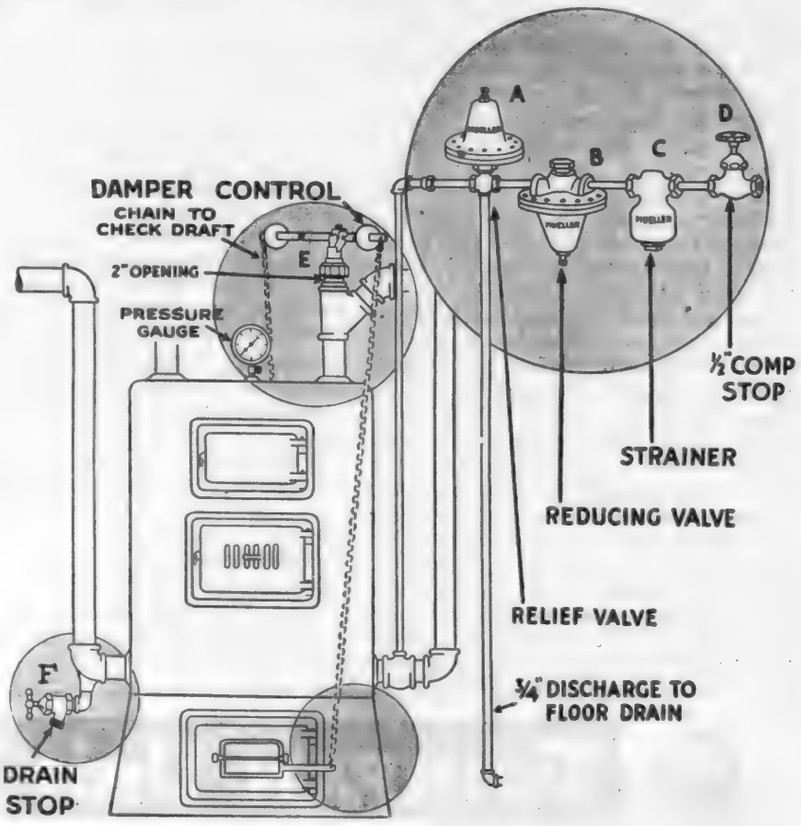
Some Territory Open for Distributor. Send for Catalog.

FRANKLIN GAS BURNER MFG. CO.
VINE AND MITCHELL AVES. CINCINNATI, O.

MUELLER

Automatic Hot Water Heat Control

1. No expansion tank, either open or closed.
2. Quickly installed on either new or old jobs.
3. Water in system always fresh.
4. Rapid circulation, due to pressure and fresh water.
5. Entirely automatic as to supply, relief and damper regulation.
6. A very considerable saving in fuel, due to automatic control of dampers and rapid circulation.
7. Perfectly safe, as both reducing valve and relief valve are operated by the pressure of the water in the system.
8. The reducing and relief valves are positive in action and durable, the working parts being made of bronze with phosphor-bronze diaphragms.
9. The boiling point of water raised to higher point than with the open system.



Exit Expansion Tank!

Why bother with expansion tanks in your hot water installations—why inflict the expansion tank nuisance on your customers — when the Mueller Tankless Automatic System of Water Heat Control is a better, safer and no more costly method of control? Mueller has made the expensive and troublesome expansion tank obsolete. The diagram above shows how simple the Mueller system is. The operation is entirely automatic. The care and responsibility of attending to the heating system is reduced to the smallest degree. That's what pleases the householder, and makes the Mueller Automatic System an easy one to sell.

The simplicity of installation cuts your labor costs. The parts are shipped assembled and can be installed in an hour. Read the great advantages listed above, and remember that this perfected and simplified system does not cost a penny more than the antiquated open or closed tank makeshift.

Distributed by Leading Jobbers Everywhere

MUELLER CO. *(Established 1857)*

Factories: Decatur, Ill.; Port Huron, Mich.

Canadian Factory
MUELLER, Limited, Sarnia

Branches
New York, San Francisco, Los Angeles

Write for Details

Central Station Heating Notes

Austin, Minn.—Prospects for a central heating plant in the downtown section of Austin have been enhanced through the report of a plan by Bain & Robb, St. Paul, Minn., at a meeting of business men, showing that with the present power and lighting equipment of Austin, the scheme could be successfully worked there. The cost of laying the main channel and laterals is estimated at $60,000. The tentative plan calls for the metering of the steam which would sell at $1.00 per 1000 lbs.

Paducah, Ky.—Rapid progress is reported in the construction of a heating plant which will heat the city hall, patrol house and central fire station. The building to house the plant is being built between the city hall and patrol house. E. D. Hannan has the boiler and plumbing installation contract.

Wadena, Mich.—At a special meeting of the city council, held September 14, it was decided to extend the heating mains on Aldrich Avenue to Second Street, S. E. Connections will be made to the Waldo Hotel property, the main Peterson-Biddick Building, across the street, and the Mason Bros. Co. Building.

San Francisco, Cal.—Rates for steam heat supplied stores and apartments by the Pacific Gas & Electric Company in San Francisco and the bay district cities have been reduced by the State Railroad Commission. This follows the recent reduction of 25 cents per barrel in fuel-oil prices. The new schedule for steam heat reduces the initial rate from $1.44 to $1.34 per 1000 lbs. for the first 20,000 lbs., and from $1.24 to $1.14 per 1000 lbs. for the next 25,000 lbs.

Kewanee, Ill., is to have a central heating station owned by citizens and called the Central Heating Company. This organization succeeds the Kewanee Public Service Company, and will install two 350 H.P. boilers to take care of heating in the business district in that city.

University of Iowa, Iowa City, Ia., will have a new central heating plant. It will be located at the east end of the Burlington Street bridge and will supply heat for all of the university buildings located on the campus.

Reedsburg, Wis., is considering the construction of a central heating station that will distribute to the business district and the residential territory immediately surrounding it.

Bismarck Evangelical Hospital, Bismarck, No. Dakota, is planning to erect a combined central heating and laundry plant.

Ryderwood, Wash., is to remodel its central heating plant which will be able to furnish heat for the entire business section of the city, the churches, community house and the dormitories of the Long-Bell Lumber Company.

Owatonna, Minn., has started work on a combined steam-heating, electric light and power plant.

Ellendale Electric Company, Ellendale, No. Dak., will extend its steam heating main to additional business blocks during the Fall.

New Incorporations

Save-U-Ventilating Co., Milwaukee, Wis. Capital $15,000.

Baldwin Aerifactor Oil Burner Co., New York, capital $100,000, to manufacture a patented oil burner. Among the principals is J. E. Cleveland, 149 Broadway, New York.

Ballard Super Oil Burner Company of Rhode Island, Providence, R. I., incorporated with 500 shares of no par value. Incorporators: Hazel C. Kresge, Summit; Margaret A. Ryan and Louis W. Dunn, of Providence.

New Firms

Jos. A. Langdon & Sons Co., Pittsburgh, Pa., announces that the company, which operates as heating and ventilating engineers and contractors, now has associated with it E. E. Kaschub, who was for 32 years connected with the Iron City Heating Company, heating and piping contractors. During the last 19 years he has been secretary and treasurer of that corporation. The name of the company has been changed to the Langdon-Kaschub Company, with offices and shops at 2030 Fifth Avenue, Pittsburgh. Mr. Kaschub, the new member of the company, is a director of Perry State Bank of Pittsburgh, and vice-president of the Perry Realty Company.

TWINFAN Unit Heaters

Why Super-heat This Part of a Building? →

Did you ever check the temperatures at the ceiling and at eye-level in an industrial building heated with ordinary radiation? If not, you may be surprised to know that 15 to 20 degrees' difference is common. It often runs higher.

Why maintain 80 to 85 degrees at the ceiling to get 65 degrees where you want it? You don't have to with the TwinFan Unit System. It keeps the heat down where it is needed. Picture the saving possible to your customers through this common sense use of the heat generated.

Our representative can give you all the information you need when you are talking to industrial concerns.

And in addition to the saving to the customer the TwinFan System requires only a fraction of the labor to install that is necessary with ordinary radiation. The result is bigger and surer profits to you. Why not get in touch with us now.

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

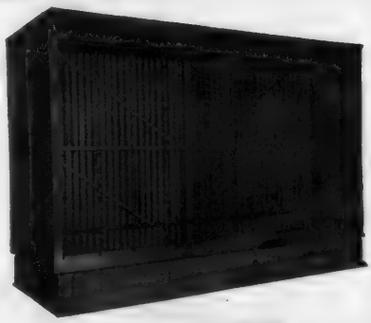
Fan Installation, Metropolitan Theatre, Boston

R. D. KIMBALL & CO.
ENGINEERS

OLYMPIA
CONSTRUCTION CO.
CONTRACTORS

New England's Largest Theatre

IN this building, the Metropolitan Theatre, Boston, Three Double-Width Massachusetts Fans provide 165,000 cubic feet of air per minute, and two Massachusetts Air Washers remove dirt and foreign matter from the entering air. Seven Massachusetts Exhaust Fans expel all impure air.



Installation of Massachusetts Ventilating Equipment—backed by twenty-five years manufacturing experience—is an economical health necessity.

The Massachusetts Blower Company and its various offices welcome the opportunity to consult with interested parties, its policy being to help users purchase proper equipment economically.

MASSACHUSETTS BLOWER COMPANY

WATERTOWN — DIVISION OF — MASSACHUSETTS

THE BISHOP & BABCOCK MFG. CO.

GENERAL OFFICES & FACTORIES - CLEVELAND, OHIO

"Readers Announcement"

Our Educational Service is being extended to readers of THE HEATING AND VENTILATING MAGAZINE. It is for Manufacturing and Contracting folks, as Employers, Draftsmen, Salesmen, Mechanics, Clerks, Apprentices, etc.

Since 1910 the St. Louis Technical Institute has taught quite an army of folks desiring to improve their opportunities. Our courses are Modern, Comprehensive and Official, and designed to give you those higher, finer touches your profession requires.

We Teach You In Your Own Home, Personal, Clear, Direct

Our School Directory sent Free to interested parties. Indicate your Course when writing.
HEATING VENTILATING ENGINEERING
SPECIAL STEAM AND WATER HEATING
PLUMBING DESIGN AND INSTALLATION
WARM AIR HEATING
CONTRACTING AND ESTIMATING
MECHANICAL DRAFTING

Start with the 1925-26 School Season

ST. LOUIS TECHNICAL INSTITUTE
4541 Clayton Ave., St. Louis, Missouri

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITION WANTED—Thoroughly experienced estimator, designer and sales engineer on heating, ventilating and power plant work, is considering making a change January 1, and will appreciate an interview with responsible concern meanwhile. Address Box 110, care Heating and Ventilating.

POSITION WANTED—By first-class estimator on heating, ventilating and power work. Experienced also in designing and layout work. Minimum salary, $55.00 per week. Address Box 114, care Heating and Ventilating Magazine.

SALESMAN WANTED — Boiler salesman wanted for New Jersey and western Pennsylvania territory, by prominent and old-established manufacturer. Good opportunity for the right man. State age, experience and salary expected. Address Box 112, care of Heating and Ventilating Magazine.

SALES ENGINEER WANTED—Address Room 1108, 15 Park Place, New York City.

FOR SALE—Complete heating unit, consisting of three Heine water-tube boilers, 305 H.P., two feed pumps, one fan engine, one feed-water tank, wooden frame galvanized-iron building and stack. Bargain. Remington Arms Co., Inc., Bridgeport, Conn.

MANUFACTURER'S AGENT WANTED—High-grade, aggressive manufacturer's agent wanted to handle complete line of ozone apparatus for water purification, ventilation and industrial application. Write, stating experience, territory covered and line selling. Address Box 111, care of Heating and Ventilating Magazine.

ENGINEER AND SALESMAN WANTED—Position open for capable heating and ventilating engineer and salesman, with well-established contractor located in Ohio. Experience in selling architects' and owners' high-grade heating installations absolutely necessary. Address Box 113, care of Heating and Ventilating Magazine.

STEAM TRAPS
AIR TRAPS
STEAM SEPARATORS
EXHAUST HEADS
OIL SEPARATORS
BOILER ALARM WATER COLUMNS
STRAINERS

WRIGHT — **AUSTIN**

WRIGHT-AUSTIN CO.
DETROIT, MICHIGAN

NATION WIDE CONFIDENCE

IN THE

Nu-Notch
REG. U.S. PAT. OFF.

Mushroom Air Diffuser for Auditoriums

assures the Architect and Engineer who have never used this

Perfect Air Diffuser

of positive results and everlasting satisfied service.

Costs no more than the inferior imitations on the market.

Insist on "Nu-Notch"

Knowles Mushroom Ventilator Co.
202-204 Franklin St. **NEW YORK CITY**

A LOW PRICED DEPENDABLE OIL BURNER

THE IDEAL ROTARY is a mechanical draft burner, either full automatic or manual control.

It can be sold in price competition with atmospheric types.

The flame is a circular horizontal sheet, applied at the grate line.

Domestic fuels of all grades commonly supplied may be used. The lower limit is 22° A.P.I.

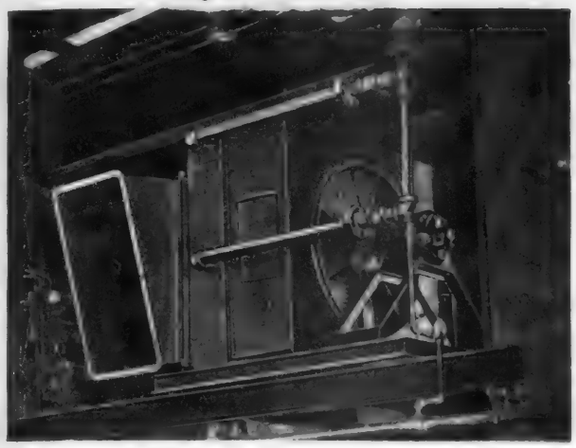
Manually controlled burners are priced as low as $75.00, net to dealer.

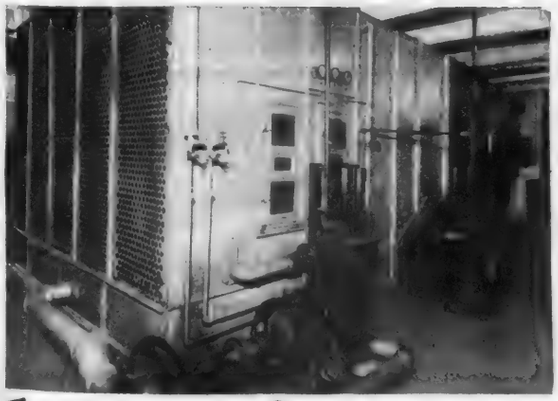
The IDEAL ROTARY makes a strong appeal to the heating contractor because of low price, low cost of installation and simplicity almost eliminating service calls.

A request from you will result in a demonstration of the IDEAL ROTARY, at a time and place to suit your convenience.

IDEAL ROTARY BURNER CO.
2 W. Clark Ave., **York, Pa.**

Use "Buffalo" equipment on every job





There is a real reason for using Buffalo equipment on every heating job—"Buffalo" has a complete line of heating and ventilating apparatus, it's priced right, and users testify to its quality.

We illustrate on this page an installation of a Buffalo Unit Heater. We make the famous low-cost high-efficiency "Breezo-Fin," one of the lightest, strongest, lowest priced and most effective unit heaters on the market. We also make direct-fired heaters for burning shavings, refuse, etc., as well as "Vento" and pipe coil units.

For factory heating under certain conditions, we build the "central fan" type of heating equipment shown in the second picture. This includes fan and steam heating coils, and is one of the oldest and most successful methods of indirect heating. Hundreds of contractors and users "swear by" Buffalo fan and heater systems.

For the very finest types of buildings, theatres, stores, schools, hotels, offices and a few factories, there is no method of heating and ventilating that compares in reliability, simplicity, effectiveness, and ultimate low cost with the "Buffalo-Carrier" method (lower cut) of supplying washed and tempered air, noiselessly, continuously and positively to any or all parts of the building. Buffalo fans and heaters, Carrier air washers and Buffalo pumps, all manufactured to work together, guarantee ideal results.

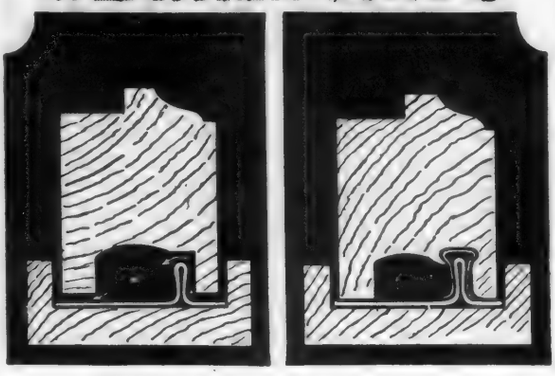
If you do not know the full story of Buffalo equipment, why not let us tell you about it NOW?

Buffalo Forge Company

480 Broadway BUFFALO, N. Y.

heating—ventilating

HIGGIN
ALL METAL
WEATHER STRIPS



Ordinary single-member strip
Sash grooved for cord

The exclusive Higgin Insert
Strip completes the job

Are you recommending the right weather strips?

The only weatherstrips made with a self-holding spring-flange **Insert** are Higgin All-Metal Weatherstrips.

No window without this **Insert** can be as draft-tight as a Higgin-equipped window. The illustration shows why.

The spring flanges of the **Insert** lightly grip the sides of the raised rib and close the space around the sash at every point. There is no air leakage where the sash is cut out for the cord, nor seepage around the rib when the sash shrinks. The metal-to-metal contact insures a perfect fit and closure; also an easy-sliding sash under all conditions.

A Higgin Installation means added comfort, greater fuel saving, increased satisfaction with the heating system.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All-Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never lose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The HIGGIN Mfg. Co.
Newport, Ky.
Toronto, Canada.
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens

Wing *Featherweight* Unit Heaters Save Heat Thru Ease of Control!

Most direct radiator systems are designed for maintaining 60 or 70 degrees in zero weather. But in mild or average winter weather this excess heat is not needed and it is necessary to turn off a great number of radiator valves to meet the reduced demand. Such a task is a tedious one, dependent upon the human element, and in consequence is neglected. Instead, windows are opened, and the heat allowed to escape.

This heat waste is eliminated with Wing Featherweight Unit Heaters because they are easily controlled—THE SNAP OF A SWITCH TURNS OFF THE HEAT!

L. J. Wing Mfg. Co.

Fans and Blowers — *Damper Regulation*
Unit Heaters — *Small Turbines*

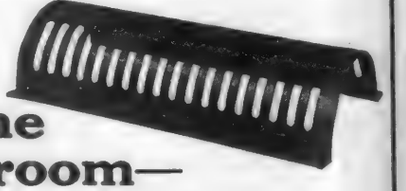
Hudson and 13th Streets — **NEW YORK**

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BLDG.
PHILADELPHIA

Specify the Supreme Mushroom—



for your next theatre or auditorium installation

Greater Air Capacity, Unbreakable, Ornamental, No Rattles, Low Cost.

SEND FOR PARTICULARS

Supreme Heater & Ventilating Corp.
Engineers and Manufacturers, ST. LOUIS, MO.

SALES ENGINEERS—Some desirable territory is open on this line.

JUNIOR SENIOR HIGH SCHOOL, CLAIRTON, PA.

Architect, Chas. W. Bates, Wheeling, W. Va.
Heating Contractor, The W. J. Scholl Co., Youngstown, Ohio.

This New High School Building is Now Being Equipped with Forty-four Buckeye Heatovents

ARCHITECTS and builders everywhere are enthusiastic about the appearance of the Buckeye Heatovent.

It is finished with the same care and workmanship as any fine piece of furniture or expensive automobile. The Buckeye Heatovent, unit system of heating and ventilating, is made in any finish and will harmonize with the interior of your particular building.

Upon request we will send you an illustrated booklet giving full information about the Buckeye Heatovent.

Buckeye Heatovents incorporate the latest and best engineering principles and are constructed of the very highest class materials and workmanship. These features, together with that intangible asset "Buckeye Service" insure your clients against poor ventilation and future repair bills.

Full description and detailed drawings are to be had in our data book for architects and engineers, available on request. But our complete service includes, also, that of co-operation on the part of members of our engineering staff, who will consult with you on your heating problems.

Our new catalog is now ready. Write for your copy now.
Any of our Branches can supply you.

BUCKEYE BLOWER CO.

COLUMBUS, OHIO

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333 Jackson Bldg., Buffalo, N. Y.
801 Rose Building, Cleveland, Ohio.
608 Transportation Bldg., Chicago, Ill.
1226 California St., Denver, Colo.
3115 N. Central Ave. Indianapolis, Ind.
1011 Pioneer Trust Co. Building, Kansas City, Mo.
1400 Broadway, New York, N. Y.
1236 Callowhill St., Philadelphia, Pa.
709 Columbia Bank Building, Pittsburgh, Pa.
210 Dooly Building, Salt Lake City, Utah.
405 Sharon Building, San Francisco, Cal.
Fales Building, Seattle, Washington.
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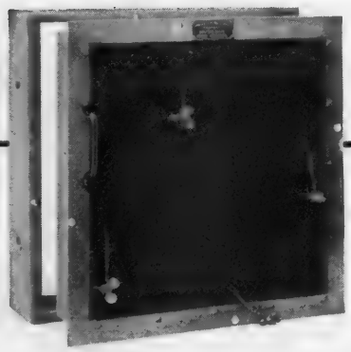

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SPRACO AIR FILTERS

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(Extract from paper read by Mr. S. E. Dibble at the semi-annual meeting of the American Society of Heating and Ventilating Engineers, Atlantic City, N. J., June 1925.)

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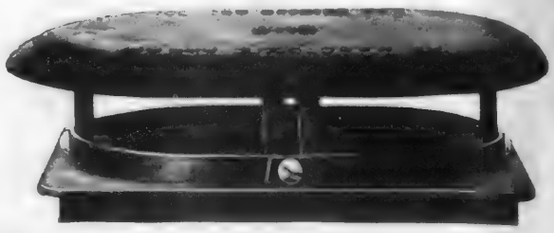

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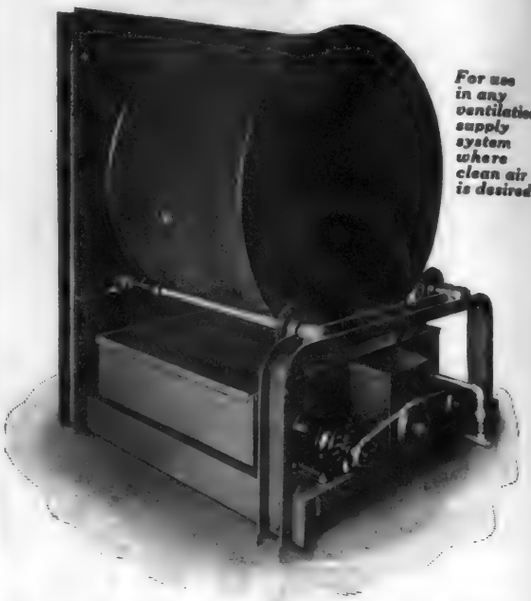

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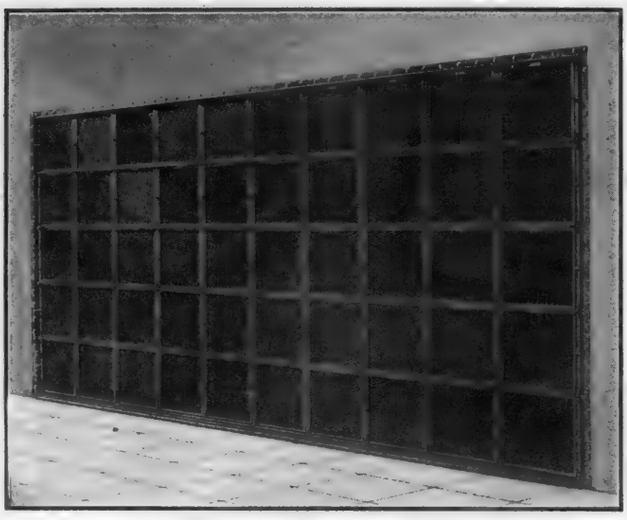

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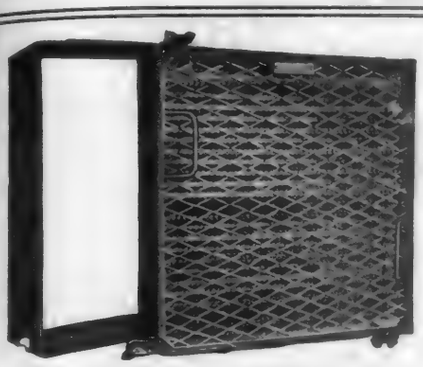

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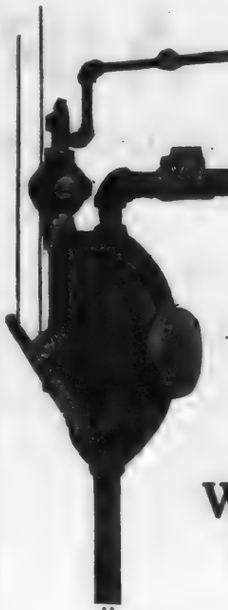

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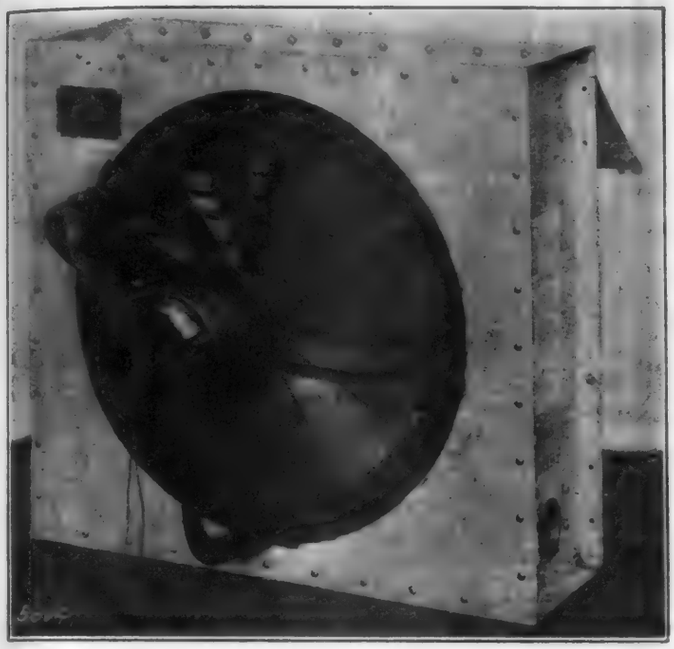

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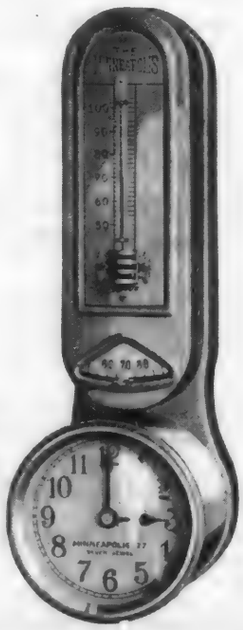

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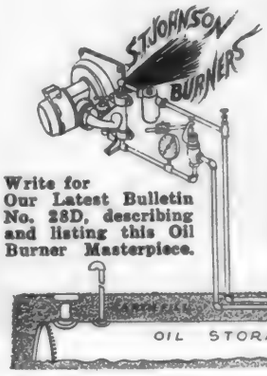

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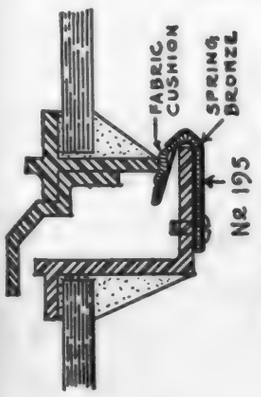

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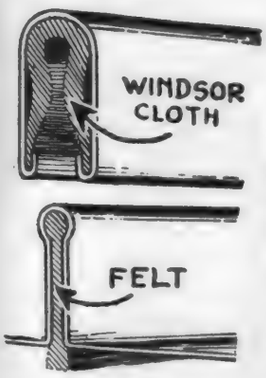

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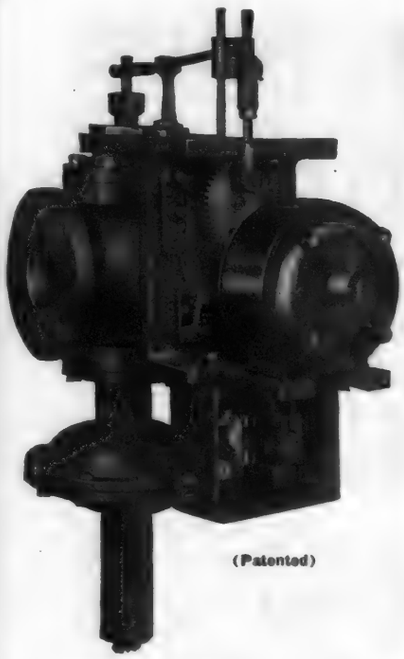

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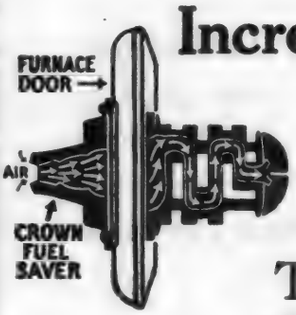

Increasing Heat and Saving Fuel

Easily attached to any style, any size heating plant

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THE CROWN Fuel Saver and Smoke Abater is scientifically designed to supply the needed hot oxygen over the fire bed, thus conforming to the recommendation of government engineers who have demonstrated that additional air must be supplied *over the fire* in order to complete combustion. We guarantee a 20% saving in fuel. The CROWN is worthy of the investigation of every heating engineer, it makes friends and liberal profits.

CROWN FUEL SAVER CO.

70 N. 10th Street, Richmond, Ind.

Sole Canadian Distributor:

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NEW HARTMANN ADJUSTABLE RADIATOR BRACKETS

(Patented)

Notch Fits Any Type Radiation
Slots for Horizontal and Vertical Adjustment
Slot Allows for Difference in Brick Spacing

Write for Dimensions and Price List

CHARLES HARTMANN CO.

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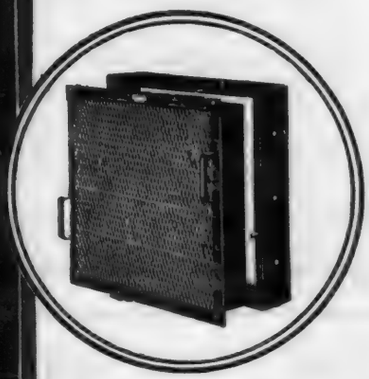

Left: American Radiator Building, New York. Raymond M. Hood, Architect; Reed Air Filters specified by Meyer, Strong & Jones, Consulting Engineers; Installed by Baker Smith & Co., Contractors.

Used in AMERICAN RADIATOR BUILDING

Pure air was of course required for the restaurant in the American Radiator Building. And, as is usually the case where careful investigation precedes purchase of equipment, Reed Air Filters were chosen to provide it. Send the coupon for useful bulletins.

REED AIR FILTER CO., *Incorporated*
215 Central Avenue, Louisville, Kentucky
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REED AIR FILTER COMPANY, Inc.
215 Central Avenue, Louisville, Ky.

Gentlemen: Please send me without obligation the following bulletins:

No. 106—The Reed System of Air Filtration
No. 107—Data, Tests and Specifications
No. 108—Reed Air Filters for General Ventilation

Possible use .....
Name .....
Street .....
City and State .....
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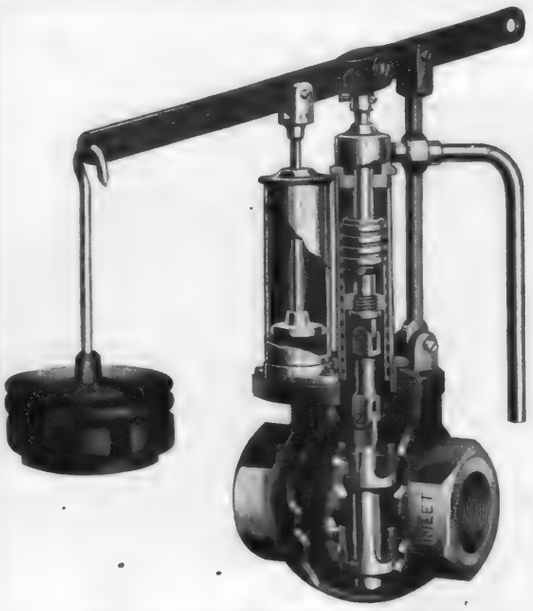
Reed Air
TRADE MARK
filters ALL METAL

(REED AIR FILTERS are manufactured under patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.)



No. 1 Pressure Regulator—Piston Type
Made in sizes ⅜ to 14 in. inclusive—Std. and Ex. Hvy.
Sizes 1¼ in. and under made with bronze bodies—screwed ends only.
Sizes 2 to 6 in. inclusive made with iron bodies—screwed or flanged ends.
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KLIPFEL
PRESSURE REGULATORS

Automatically reduce any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Maintain reduced pressure constantly regardless of fluctuations in boiler pressure, or changes in the demand for steam.

Simple, rugged and direct acting. As low pressure builds-up and exerts pressure under piston, a balance is formed between low pressure and weighting, which in turn regulates the inner valve opening.

Visible in action. Lever may be used to open, close or test by hand. Position of inner valve may be easily judged by looking at the lever.

Bronze cylinder, multiple grooved piston and balanced plunger type bronze inner valve. All working parts removable while valve body remains in the pipe line.

No troublesome springs, toggles, packing boxes or pilot valves. Dashpot included, which insures steady service pressure and overcomes any tendency of valve to chatter or vibrate.

Guaranteed to closely regulate at maximum steam loads, as the capacity—size for size—is equal to or greater than that of any competing pressure regulator.

We Invite Correspondence.

KLIPFEL MFG. CO., 2641-59 W. Harrison St. CHICAGO, ILL.

Manufacturers of a Complete Line of Steam Specialties including Expanded Outlet Pressure Regulators (Both Piston and Diaphragm Types)—Float Valves—Pump Governors—Back Pressure Valves—Relief Valves—Grease Traps—Steam Traps and many other Specialties.
Sold by Leading Jobbers in all Principal Cities—Write for Catalog No. 20.

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Accurate Record Means Close Control

The closeness with which temperature may be controlled depends first upon the accuracy of the method employed for measuring and recording the temperature.

Bristol Records make possible the closest kind of control for they are accurate.

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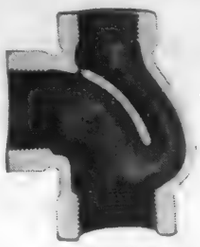
O. S. Distributer Fittings



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For hot water heating they insure a positive, uniform circulation of the hot water with equal distribution to all radiators. They prevent short circuiting and increase circulation. They save labor, fittings, and joints.

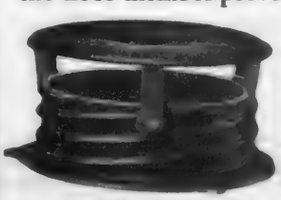
Made in 39 sizes varying from ½ to 2½ inches.

Let us send you Circular No. 51

THE GROENIGER MANUFACTURING CO.
Michigan and Buttles Aves. COLUMBUS, OHIO

For VENTILATION use LYON Toad Stools

They are Vent Caps of great strength, unobstructed throat, rigid non-rattling construction. The adjustment is from full open to full closed. The height of the floor member prevents sweeping dust and refuse into them. Their efficiency and economy make them particularly adaptable for theatres, auditoriums, etc.



Send for table of capacities and velocities. Prices etc.

LYON PRODUCTS CO., Inc.
7 So. Dearborn St.
CHICAGO ILLINOIS

Setting exact standards for the oxy-acetylene process

The Union Carbide and Carbon Research Laboratories, Inc., occupies almost a city block of floor space in this large building in Long Island City. Floor space, however, means little in a research laboratory if men and equipment are lacking. The equipment is as complete as that of any laboratory in the United States and the caliber of men is indicated by the fact that one of chemistry's most coveted prizes—the Perkin Medal—was recently awarded to one of the staff.

THE Union Carbide and Carbon Research Laboratories, Inc., at Long Island City, is really manufacturing standards for the oxy-acetylene process.

New applications of the process usually originate in the field. They could be developed by the trial and error method and passed from one welder to another by rule of thumb instruction.

The Linde Company, however, submits such new applications to its research laboratory. Here, not only is the weld tested, but the correct procedure worked out so that it is metallurgically sound. Applications perfected in the Linde laboratory work—not occasionally, but *every time.*

Every technical factor in oxy-acetylene welding and cutting is tested and checked by the laboratory. Furthermore, the laboratory furnishes Linde engineers with data sufficient to satisfy the most exacting demand for technical information.

This research laboratory is a part of Linde Process Service which is free to Linde customers for the asking.

THE LINDE AIR PRODUCTS CO.

General Offices:
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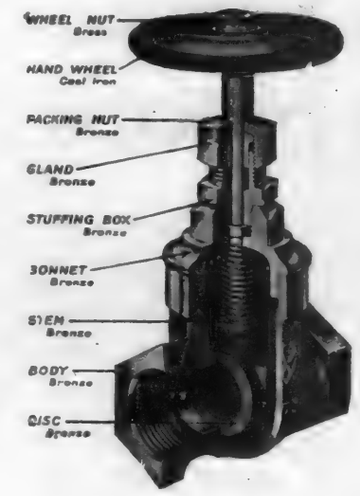
37 Plants *22 District Sales Offices* *91 Warehouses*

LINDE OXYGEN

YOU CAN DEPEND ON THE LINDE COMPANY

What is Your Valve Standard?



Most any valve will work well when new, but it takes a high grade product to stand up for a long period of years and to continue to give one hundred per cent efficient service. That's why engineers and contractors should safeguard the future interests of clients and customers by specifying the KENNEDY. In this way their specification carries with it the protection which the KENNEDY name and guarantee insures to valve users.

KENNEDY

For 47 years valve satisfaction has been the one object of the KENNEDY organization, and the improvements and developments which mark all valves bearing their trade mark are sufficient proof of the success of their efforts. Special features embodied in the design for the distinct purpose of giving long life include:

- Pipe threads of generous length which prevent leakage.
- Accurate guides for seat which prevent contact of disc with seat until the valve is ready to close.
- Stem of special bronze with high tensile and torsional strength.
- Gland in stuffing box which eliminates leaks and avoids frequent repacking.

Other special features of Kennedy Valves are given in our latest catalog. Send for copy and keep it handy.

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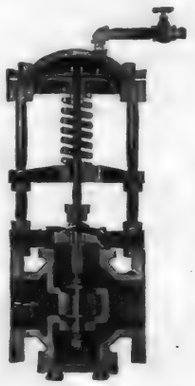
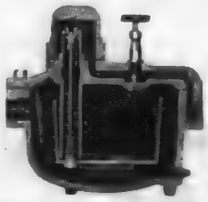


Manufacturers of a Complete Line of Specialties For 46 Years

This illustration shows a Rockaway Pressure Reducing Valve, one of the various types we manufacture. Other types, lever weighted, pilot piston operated and hydraulic operated.

Visit our Booth No. 480 at the Power Show



Steam Traps, Bucket and Ball Float Types. All Pressures.

Catalog on Request

Back Pressure Valves, Noiseless Type, Spring or Lever weighted. Sizes 2" to 30"

KIELEY & MUELLER, Inc.

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NOW is the time! Before WINTER!

Don't put off installing a VICTOR Damper Regulator until mid-winter. Put it in NOW. Save money. Save coal. Write for NET price list.

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ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

281 South St., Newark, N. J.

VICTOR No. 1 For pressures up to 150 lb.

American S & B Instruments

reduce manufacturing costs, eliminate spoilage, and increase efficiency. They are the result of over 75 years' experience in solving problems of temperature, pressure speed, etc.

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*Boston, Buffalo, *Chicago, Cleveland, Detroit, *Los Angeles, Tulsa, Philadelphia, *Pittsburgh, Salt Lake City, *Seattle
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Honeco Controller

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Cork Lined Houses Make Comfortable Homes

Residence of Mr. Lee Nusbaum, Germantown, Philadelphia, Pa., insulated throughout with Armstrong's Corkboard, one and one-half inches thick

Made of pure cork in boards 12 inches by 32 or 36 inches—from 1 inch to 3 inches thick.

Trade Mark

Heated with over 40% Less Fuel

How effectively Armstrong's Corkboard reduces the transmission of heat is shown below. The values given are in B.t.u. per sq.ft. of surface per hour, per degree difference in temperature.

Without Insulation

Shingles, Sheathing or T. & G., Rafters, Lath and Plaster. Transmission = .22 B.t.u.

With Armstrong's Corkboard

Shingles, Sheathing or T. & G., Rafters, 2" Armstrong's Corkboard, Plaster. Transmission = .09 B.t.u.

In other words, 2 inches of Armstrong's Corkboard reduces the heat loss 59%.

When Mr. Lee Nusbaum built his new home in Germantown, Philadelphia, in 1923, he insulated the exterior walls and second story ceiling with 1½ inches of Armstrong's Corkboard Insulation. The following spring (April 23, 1924) Mr. Nusbaum wrote:

> "This house has a cubical content of about 60,000 cubic feet and from the first of October (1923) up to the present date I have used about twelve tons of coal, while a house of this character should use at least twenty-two tons of coal in this period."

This saving of 10 tons of coal—over 40%—is an excellent demonstration of the effect of Armstrong's Corkboard Insulation. It proves how greatly the heat losses through cork lined walls and roofs are reduced, and it shows clearly that you can safely install a smaller system which will save money for the owner not only in first cost, but in operating cost as well.

Cork insulated houses are being planned every day. So that you can figure them on the proper basis, get full information regarding the heat transmission through the various types of construction with Armstrong's Corkboard Insulation. Complete data will be sent on request. Armstrong Cork & Insulation Company, 202 Twenty-fourth Street, Pittsburgh, Pa. In Canada, McGill Building, Montreal, Quebec.

Branches in the Principal Cities

Armstrong's Corkboard Insulation

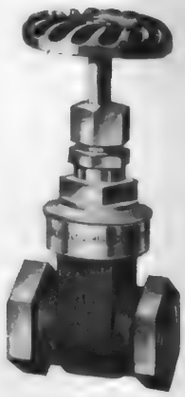
for Residential, Commercial and Industrial Buildings

Divorces are Expensive!

The man who is choosing valve equipment might be compared to the young man who is about to choose a wife. Both the wife and the valve equipment must be lived with afterwards, and divorce is both undesirable and very expensive.

Valves are really important items. A valve is not merely a mass of bronze or iron with a stem and a wheel. Properly designed and constructed valves are the product of engineering skill and there is as much difference in their makeup as in the clothes that people wear.

Standardize on Scott Valves. Over fifty years of valve engineering experience is woven into the perfected Scott Valve line of today.



The famous Scott No. 1 Gate Valve

Scott Valve Manufacturing Company

3963 McKinley Avenue **Detroit, Michigan**

SCOTT SINCE 1886 VALVES

SIGN OF VALUE

"MAXIMUM SERVICE PER DOLLAR"

The STICKLE Thermostatic Radiator Valve

The Expansion principle in return line Radiator Traps is not novel or new. Consequently the difference in this class of Traps is in the construction.

The expansive movement of this diaphragm is fully one-quarter inch, which is much more than is necessary for opening and closing the valve. This gives a factor of safety which is greater than any valve made, consequently it requires no adjustment. May we send you our bulletin?

STICKLE STEAM SPECIALTIES CO.

INDIANAPOLIS, IND.

New York Office 46 E. 41st St.

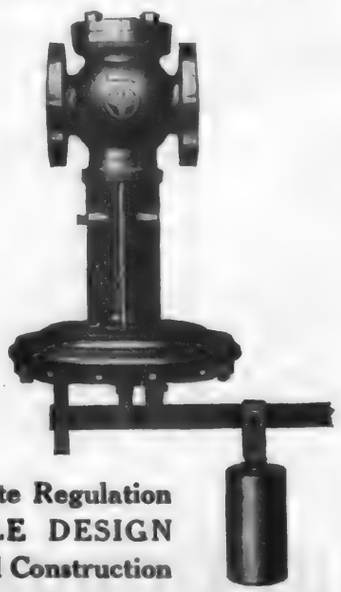
Boston Office 52 Sudbury St.

USE A MASON

Lever Style Reducing Valve

on your next

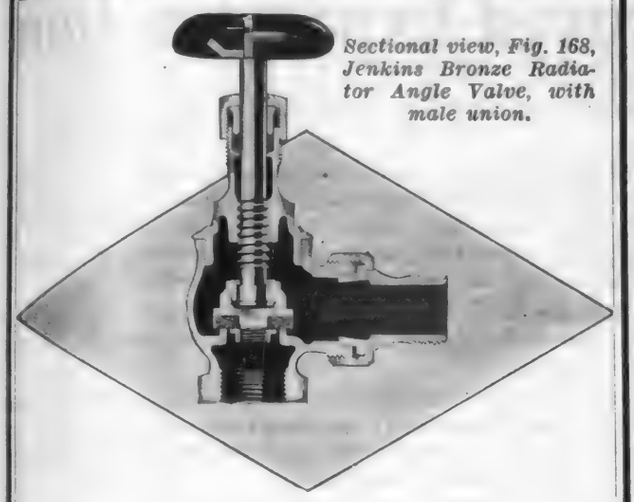
HEATING CONTRACT



Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY

Boston, Mass. San Francisco, Cal. Montreal, Canada



Sectional view, Fig. 168, Jenkins Bronze Radiator Angle Valve, with male union.

Get the credit for a good installation

Fig. 352, screwed, Jenkins Standard Bronze Swing Check Valve.

Fig. 110, screwed, Jenkins Standard Bronze Cross Valve.

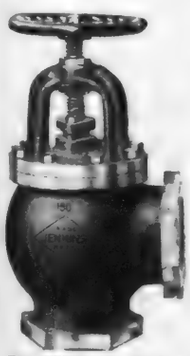


Fig. 143, screwed, Jenkins Standard Iron Body Angle Valve.

The valves you install are **your** valves to many owners. You are given the credit if the valve service is good, and when the equipment is faulty, you are apt to be held responsible.

It's easy to make sure of getting credit for a good installation. The Jenkins "Diamond" on a valve is all you need to assure you of a valve that does its job and does it well. The wide range of the Jenkins line provides a valve for practically every requirement.

JENKINS BROS.

80 White St.....New York, N. Y.
524 Atlantic Ave.....Boston, Mass.
133 No. Seventh St....Philadelphia, Pa.
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JENKINS BROS., LIMITED

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Always marked with the "Diamond"

Jenkins Valves

SINCE 1864

LAVIGNE COMMONWEALTH

RADIATOR VALVES

This Handle Offers A *"Friendly"* Grip

The "Knobby-Grip" composition handle supplied on Commonwealth Lavigne Radiator Valves invites you to take hold and turn. This handle is shaped like the familiar door knob with a milled edge and, since no metal is exposed, is always cool. It is fashioned so as not to collect dust and the milled edge always offers a clean, firm grip. In addition to the more practical features, its graceful design adds to the appearance of the valve.

Service, durability and convenience are characteristics of Commonwealth Lavigne Radiator Valves which will win good will for you wherever they are installed.

In addition to a complete line of standard radiator valves we also manufacture the Lavigne Packless Quick Opening Steam Radiator Valve.

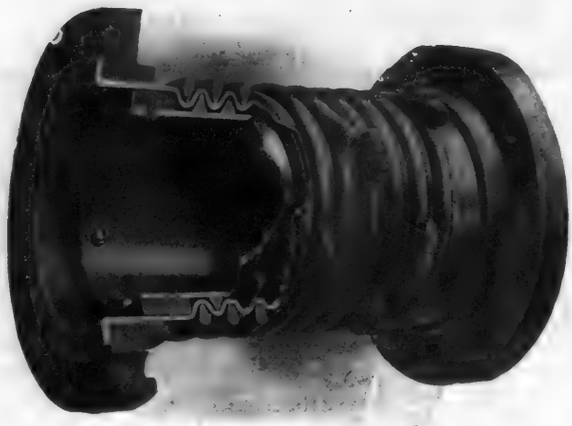
Your Jobber Can Supply You

COMMONWEALTH BRASS CORPORATION

Detroit, Michigan

The Wainwright Improved Expansion Joint

Suitable for Pipe Movement of 1½ to 2 inches



Wainwright Improved Expansion Joint

THESE fittings are of the packless type—no stuffing box to be continually adjusted—no packing to blow out, deteriorate and require frequent replacement. The multiple corrugated copper expansion tube of uniform thickness and strength absorbs the movement.

Outside AND INSIDE expansion equalizing rings assure equal distribution of movement among the several corrugations.

The joint is protected from erosion and abrasive wear by the inner hard brass or copper sleeve which also affords smooth passage with least friction loss to steam, water, or gas being handled.

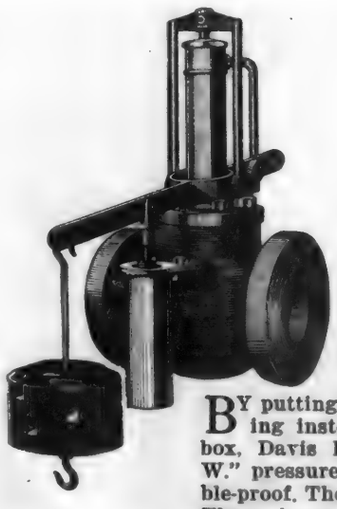
We will appreciate the opportunity of discussing special problems. Bulletin V-46, containing sizes, rating tables and layouts for typical installations, as well as information on Wainwright Anchors and Guides, will be sent on request.

WHEELER CONDENSER & ENGINEERING CO.

149 Broadway, New York

Works - CARTERET, N.J., NEWBURGH, N.Y.

3



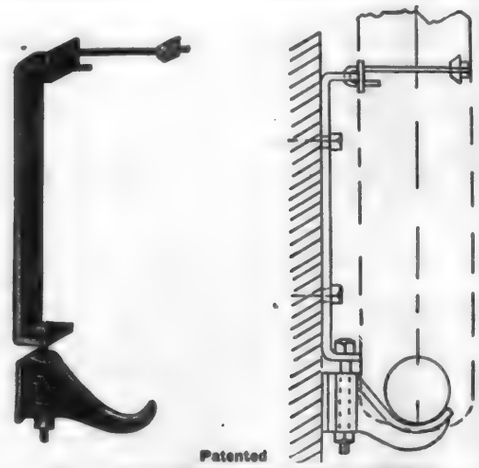
BY putting in a bronze bushing instead of a stuffing box, Davis has made "P. & W." pressure regulators trouble-proof. There is no leakage. There is no friction on the stem. Install the trouble-proof Davis "P. & W." Pressure Regulator on your next job. Your customer will appreciate your good judgment.

G. M. Davis Regulator Co.
436 Milwaukee Ave., Chicago

1875—Valve makers for fifty years—1925

DAVIS VALVE SPECIALTIES
[STEAM SAVERS SINCE 1875]

HV-11-B-RTG



Patented
No. 9 Bracket for Legless Column Radiation

GLEOCKLE fits them all

It is not necessary to know the make of wall radiator to be used. Just specify Gleockle Adjustable Wall Radiator Brackets and your bracket requirements will be filled. They are made to fit any make of wall radiator, and besides being convenient, they are safe, durable, inexpensive and invisible after erection.

Send for descriptive booklet and trade discount

FIT ANY MAKE OF RADIATOR

A. F. GLEOCKLE, Jr.
415 Bay Street ROCHESTER, N. Y.

Hot Water—No Waiting

WITH

DAHLQUIST AQUATHERM COPPER RANGE BOILER

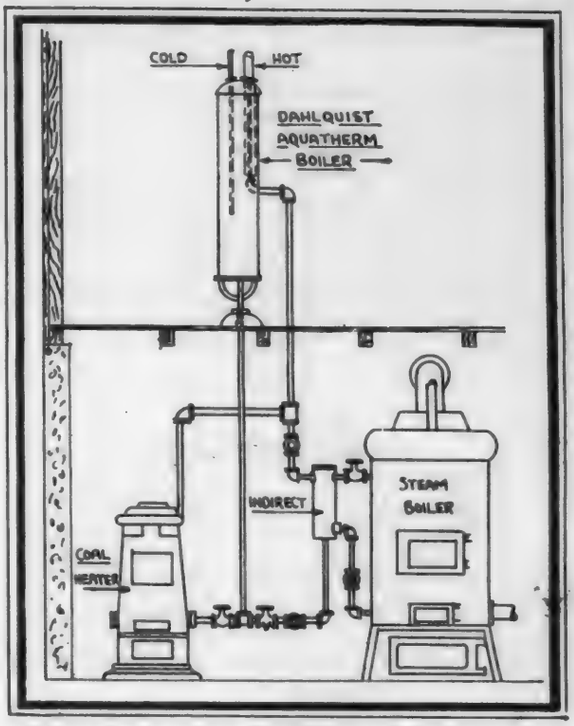
With a reduction of one-half the cost of installing a gas tank heater on any job, you can have the convenience of an instantaneous heater, either from the ordinary gas tank heater, water back in coal range, indirect heater or coil in boiler or furnace, or electric heater, by installing the **Dahlquist Aquatherm Copper Range Boiler.**

The **Dahlquist Aquatherm** can also be furnished separately in proper size for any range boiler now installed, whether heated by gas, coal, wood or electricity.

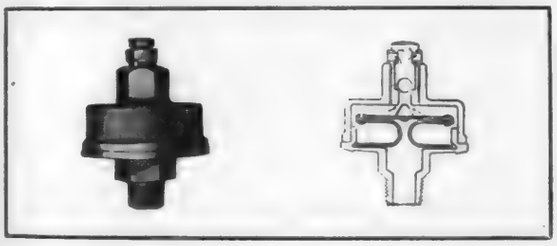
Let us send full details

DAHLQUIST MFG. CO.

40 W. 3rd St. BOSTON, MASS.



Dahlquist Aquatherm Copper Range Boiler installed in kitchen in connection with indirect water heater and coal fired water heater in cellar.



"Stay-Rite" Line

No. 3—QUICK VENT

The distinctive features of the Stay-Rite Quick Vent are its extra large venting area—5/16" diameter—and the reliable all metal Stay-Rite Thermostat. Its capacity is from two to twenty times larger than ordinary vents, but it costs no more than others of smaller capacities.

A light hollow bronze ball is used as a vacuum check, which may be easily removed for inspection or when used on open systems. Each vent is steam and water tested.

Write for prices and full details on Stay-Rite Heating Specialties

The Ideal Heating Equipment Co.

1250 West 4th Street CLEVELAND, OHIO

For Dependable Service

Specify

Kelly Automatic Steam Air Valve

All Metal
Non-Adjustable

Made in 1/8" standard pipe connection only.

KELLY BRASS WORKS

226 West Ontario St.
Chicago, Ill.

Send for full details

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

SHUR-TITE

IT NEVER FAILS

Reg. U. S. Patent Office

Guarantees a Tight Job

Pour it in the boiler and start the fire.

Stops all leaks while tests are being made.

Shur-Tite Boiler Cement is a Powder—100% efficient—No waste.

Use it on both new and repair jobs. Liberal trade discounts.

The Shur-Tite Mfg. Co.

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CENTRAL STATION STEAM CO.

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MANUFACTURERS OF
Cadillac Condensation Meters
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Packingless Expansion Joints and other special fittings for underground steam distribution mains.

HEATING Stanwood Smokeless Boilers **POWER**

HEATING CAPACITY
Steam—3300 Sq. Ft. to 25,000 Sq. Ft.
Water—5200 Sq. Ft. to 40,000 Sq. Ft.

NO MUD LEGS OR STAYBOLTS
LOW STACK TEMPERATURES
LOW WATER LEVEL—RAPID CIRCULATION

The Stanwood Corporation

CINCINNATI, OHIO
Successor to
THE HOUSTON STANWOOD & GAMBLE CO.

PIPE HANGER SHELL WITH GAS PIPE HANGER
ROD HANGER SHELL TYPICAL METHOD OF BOLTING MEMBERS TO CONCRETE
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ROD HANGER SHELL WITH EYE BOLT HANGER

Installing Self-drilling Shells in Concrete.

Phillips self-drilling Expansion Shells

For fastening all types of hangers to concrete ceilings, side beams, columns, and walls, and for bolting timbers and other equipment to concrete and stone.

Every shell is a drill and makes its own hole, thus eliminating drill trouble and expense.

A new sharp drill for every hole and a smaller hole per given size bolt, reduces labor cost of installing to absolute minimum.

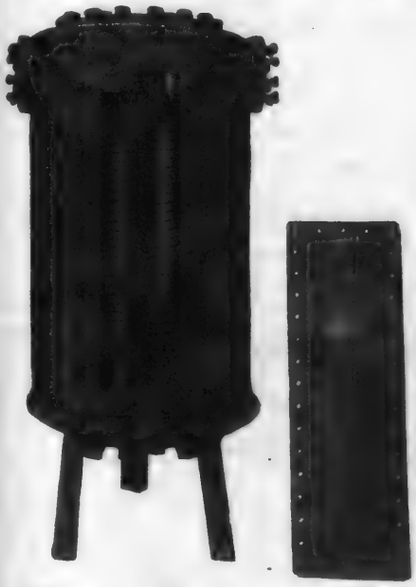
A perfect fitting hole and the enlargement of shell and hole at extreme bottom, insures reliability and better workmanship.

Quickly installed with the Phillips Spring Hammer, or with special hand chucks.

PHILLIPS DRILL COMPANY
1537 Cortland St., Chicago, Ill.

Ceiling with Phillips Spring Hammer Drill

Hotter Water with Less Fuel—



The Reilly Water Heater

has the highest rate of heat transfer of any closed heater on the market. Besides its unequalled efficiency, several special features of construction make it the best heater for dependable year-in, year-out, service.

Every coil and joint of the Reilly Water Heater can be inspected and made tight *while under pressure and without breaking any pipe joint* —an exclusive Reilly Heater feature.

Expansion strains on headers or tubes are prevented by the spring-like crimped coils—another exclusive Reilly Heater feature.

Send the coupon for complete information

The Griscom-Russell Company

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COMPANY .....
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The Griscom-Russell Company, 2155 West Street Building, New York.
Send me at once without charge a copy of your bulletin describing the Reilly Water Heater.

H&VM-11-25

The World's Finest Buildings and Largest Manufacturing Plants Use

Patterson
Hot Water Heaters

THE engineers and architects responsible for selecting materials for such large, well known buildings as those mentioned below are men of long broad experience. They cannot afford to guess—they are paid to *know* which are the best.

The reasons why these experts chose "Patterson" Hot Water Heaters are reasons why you, too, should specify this make.

During our experience of 45 years we have built Hot Water Heaters for the largest percentage of the country's most important buildings.

Some of the leading buildings equipped with Patterson Heaters:

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Ritz-Carlton Hotel	Waldorf-Astoria Hotel
Yale University	Johns Hopkins University
Harvard University	Princeton University
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Tiffany & Company	Swift & Company
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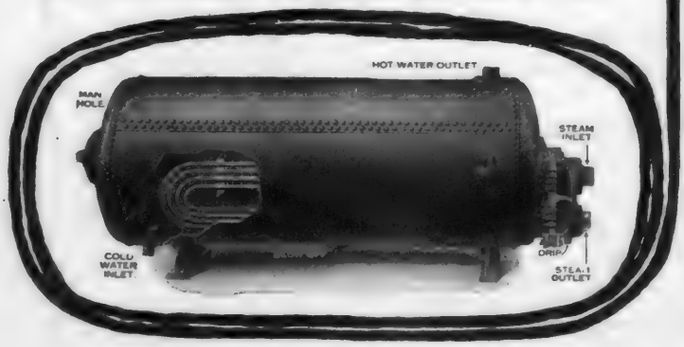

Install
Powell Valves

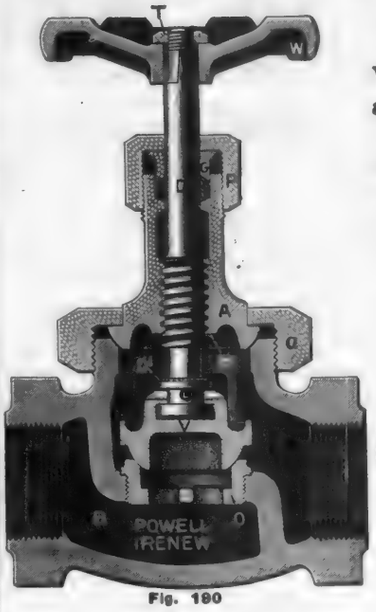

Fig. 190

And Get DEPENDABLE VALVE SERVICE at a minimum cost.

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Iron body brass mounted or all iron.

SIZES ¼ TO 3 INCHES

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THE WM. POWELL CO.
Dependable Engineering Appliances
CINCINNATI OHIO

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Compute radiation by the correct method of known heat loss factors using the

ALCLIN SLIDE RULE

Made of mahogany wood, faced with celluloid, with leather case.

Plain Runner $11.00
With Microscopic Lens $12.00

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Experienced dealers prefer

The Sun Oil Burner

1. *Quiet-Dependable*
2. *Easily Installed*
3. *Simple to Operate*
4. *Brings a good Profit*

An almost perfect score on installation of Sun Oil Burners. Out of some 15,000 equipments sold, we know of only two that have ever been altered. Thermostatic control without pilot, because of dependable low flame adjustment. Can be installed in five to eight hours by one man. Natural draft or power.

Company backed by Woods Bros., who enjoy highest rating given by Dun or Bradstreet.

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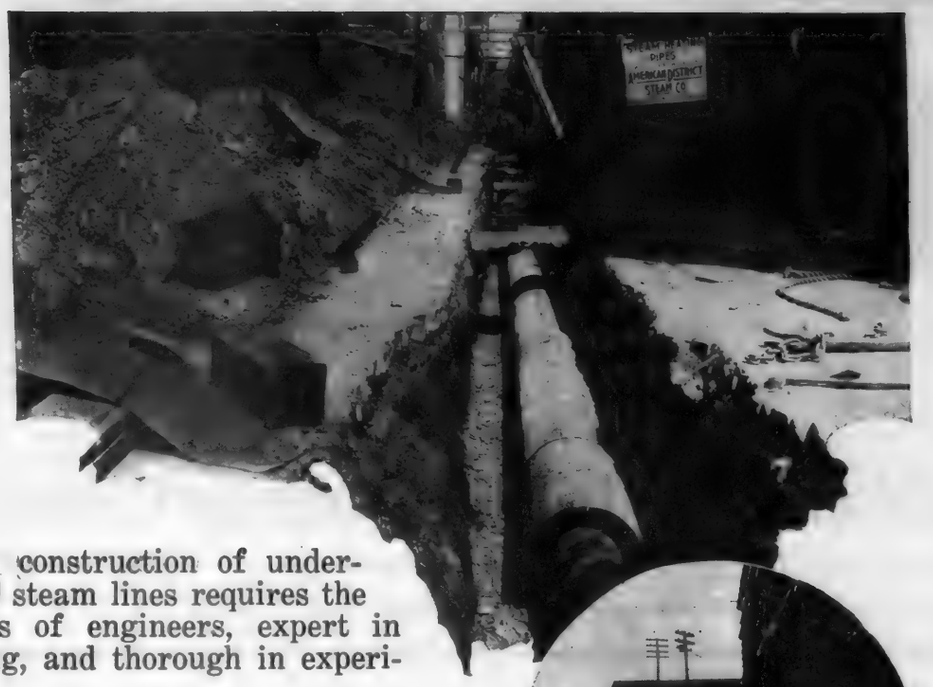
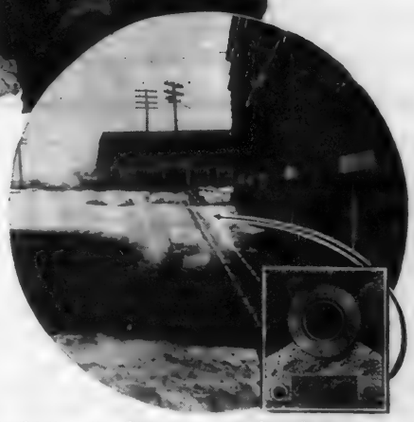
ADSCO





Proper construction of underground steam lines requires the services of engineers, expert in training, and thorough in experience.

Forty-eight years tells the story of ADSCO success in meeting this problem. Illustrated is a typical installation as it is laid down.

One of the outstanding features of ADSCO underground construction is ADSCO RED DIAMOND BRAND WOOD CASING.

Thorough kiln-drying of every stave of lumber makes certain its retention of perfect insulation. For when heat is turned in the line ADSCO casing never contracts, never checks, never allows dampness to get through to the piping. With the one operation of slipping the casing over the pipe you build the conduit and apply the insulation.

If possible send us a sketch of any proposed underground line of yours so we may make a definite recommendation for your consideration, and satisfaction.

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GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

OFFICES: NEW YORK, CHICAGO, SEATTLE

ADSCO HEATING

AMERICAN DISTRICT STEAM COMPANY North Tonawanda, N. Y. H-8

Gentlemen:

Please give me without obligation specific information as to the most economical and scientific way in which to meet this particular heating problem.

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Name.....

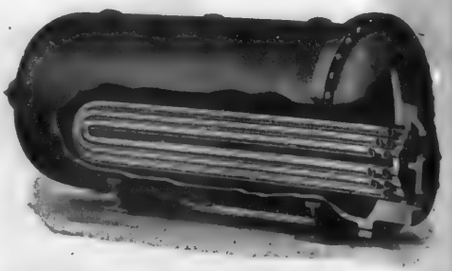
Address.....

"It's a Grand and Glorious Feeling—

to move into a building where they have hot water that's really hot.

"I told the Superintendent it was some different from the last place I was at and he said, 'Well, of course, they didn't have a National Storage Heater. If they did they'd always have plenty of hot water and yet it would cost 'em less to run and less to keep it running.'"

Bulletin 65 tells why. Ask for a copy.



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STORAGE HEATERS

The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN.

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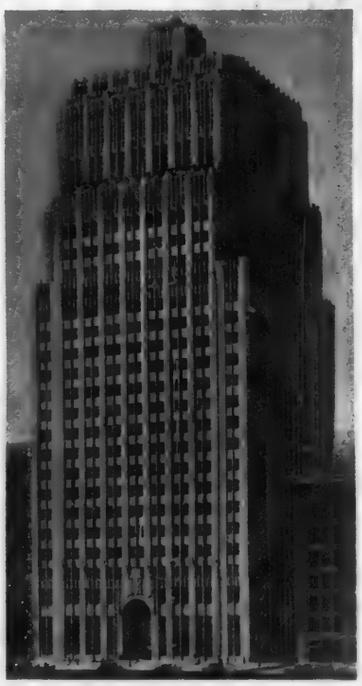

PACIFIC TELEPHONE & TELEGRAPH BUILDING
Tallest building in San Francisco

900
GORTON
Quarter-Turn Packing Lock
RADIATOR VALVES

have been installed in this newest of notable buildings.

Completes list of 6 large and prominent buildings erected in San Francisco, using GORTON (Quality) VALVES.

Exclusive Features of Gorton Valve

"Quarter Turn" of the handle operates the valve.

"Packing Lock" (Patented) eliminates leakage and replacement costs.

"Full, Unobstructed Path" through the valve eliminates friction, saving energy.

Write for full details of this quality Valve

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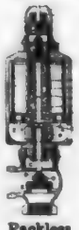
Established 1887 Representatives in Principal Cities

GOLD
AUTOMATIC
HEAT REGULATION
ELECTRICALLY OPERATED



Packless Electric Valve

Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

Write for General Catalog with Testimonials

Thermostat

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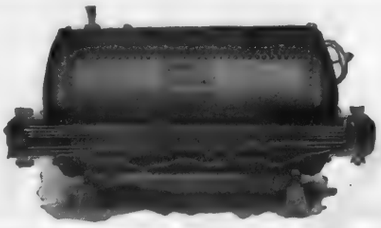
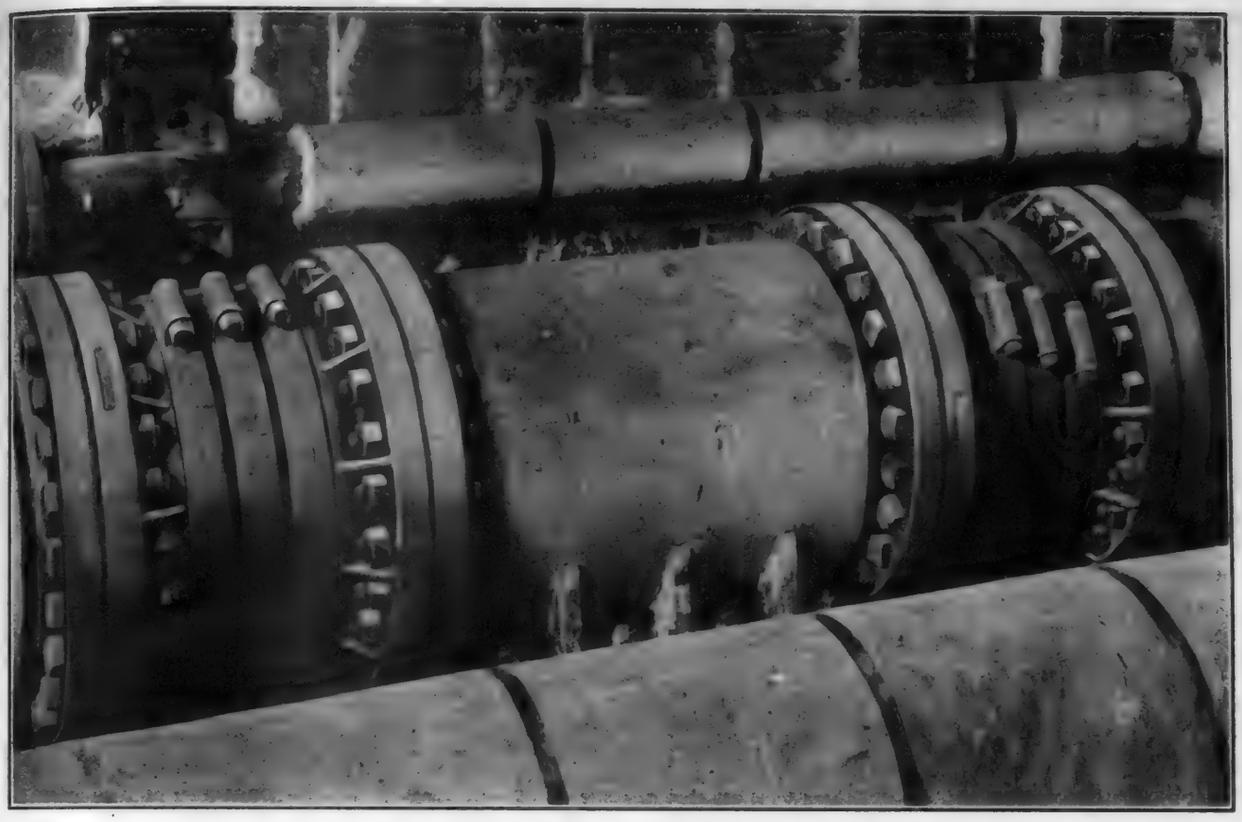
BUSH TERMINAL
220 36th STREET BROOKLYN, N. Y.



Alberger-Buffalo Storage Heaters have tubes the full length of tank which insures maximum heat transfer. Satisfaction guaranteed. Write for information on Alberger Multi Head Heaters and Howard Guided Expansion Joints.

ALBERGER HEATER COMPANY
HOWARD IRON WORKS
281-289 Chicago St. Buffalo, N. Y.



Corrugation in the one piece, seamless copper expansion element are formed—giving uniform thickness and avoiding weak spots. Exhaustive tests have shown corrugations to be of proper depth.

Compactness—

Among the many advantages afforded by BADGER SELF-EQUALIZING EXPANSION JOINTS, and a big factor in their success, is COMPACTNESS.

BADGER EXPANSION JOINTS are scarcely any larger than the pipe line itself and can be bolted in place as easily as any flanged fitting.

This means a big saving in excavating costs because there is no extra room needed around the joint itself, and where two or more pipes are run in one trench they can be laid close together, saving room along the entire length of the trench.

BADGER EXPANSION JOINTS, once in place, need no further attention. They are a one-piece joint, have no complicated parts and require no packing.

The seamless, one-piece, copper expansion element is corrugated and prepared in such a way as to enable it to withstand repeated expansion and compression. The iron rings equalize the strain and at the same time add strength to the copper.

Let our engineers tell you more about BADGER SELF-EQUALIZING EXPANSION JOINTS.

E.B. BADGER & SONS COMPANY

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Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
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Sturtevant Co., B. F., Hyde Park, Mass.
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Midwest Air Filters, Inc., New York.
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New York Blower Co., Chicago, Ill.
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Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

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AND
HUB END STYLES

NON-RISING STEM
AND
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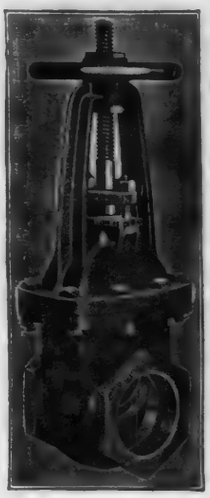

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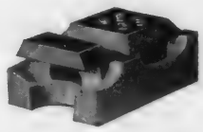
York Heating & Ventilating Corp.
1506 Locust Street, PHILADELPHIA

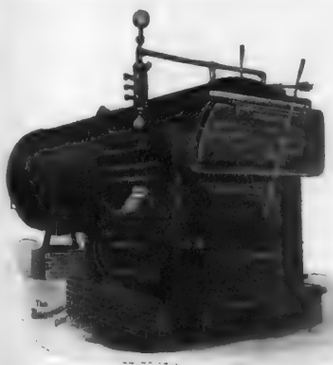
Pyramid Grates Saved $1,460 in One Season

Two years ago it cost $2,760 to heat a certain building. The following season PYRAMID GRATES did it for $1,300.



Write for circular explaining how you can do it.

Pyramid Iron Products Corp.
136 Liberty Street New York City



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

THE BROWNELL COMPANY The World Over DAYTON, OHIO, U.S.A.

Established 1855

Send for Bulletins
B6 B6A

BOILERS

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

EXPANSION JOINTS.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.
Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

FEEDERS
Boiler
Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

Feed-Water.
Davis Engineering Co., New York.
Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS
Groeinger Mfg. Co., Columbus, Ohio.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Franklin Gas Burner Mfg. Co., Cincinnati, O.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Altitude.
Pierce, Butler & Pierce Corp., New York.

Draft.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).
Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Cooling Tower Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES
Dumping
Pyramid Iron Products Co., New York.

Rocking
Pyramid Iron Products Co., New York.

Shaking
Pyramid Iron Products Co., New York.

Shaking and Dumping
Pyramid Iron Products Co., New York.

Shaking, Circular
Pyramid Iron Products Co., New York.

Stationary
Pyramid Iron Products Co., New York.

HEATERS.
Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Davis Engineering Co., New York.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit
Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).
Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.
Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.
Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.
"Gasteam".
James B. Clow & Sons, Chicago, Ill.

Vacuum.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.
American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

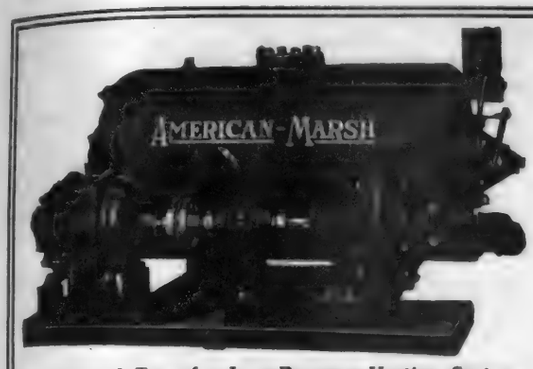
Water.
Grinnell Company, Providence, R. I.
Patterson-Kelley Co., New York.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

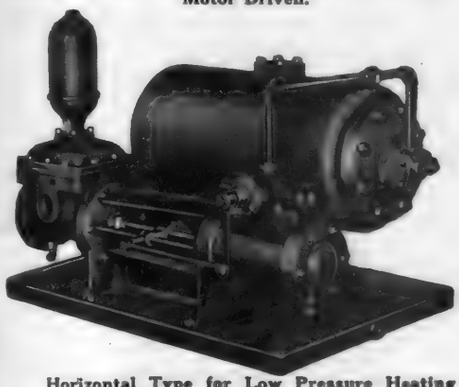
HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS
Electric Measuring.
Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.



Horizontal Type for Low Pressure Heating Systems, Motor Driven.



Horizontal Type for Low Pressure Heating Systems. Steam Driven.

AMERICAN-MARSH PUMPS

Condensation Pumps for Heating Systems

American-Marsh pumps have stood the test of time and today are recognized for their superior quality, and durability.

This line of Condensation pumps for heating systems are delivering the highest type of service. Get the installation that meets your requirements.

The Line Includes

- Boiler Feed Pumps.
- Vacuum Pumps, steam and motor driven.
- Hot Water Circulating Pumps.
- Sump or Bilge Pumps.
- Condensation Pumps, steam and motor driven, vertical and horizontal.
- Automatic Boiler Feed Pumps and Receivers

Write for Bulletins

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICHIGAN

CHICAGO OFFICE: 1220 Monadnock Block NEW YORK OFFICE: 17 Battery Place

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Air washer manufacturers and heating contractors buy so many Buffalo Class "S" Pumps because they want VALUE!

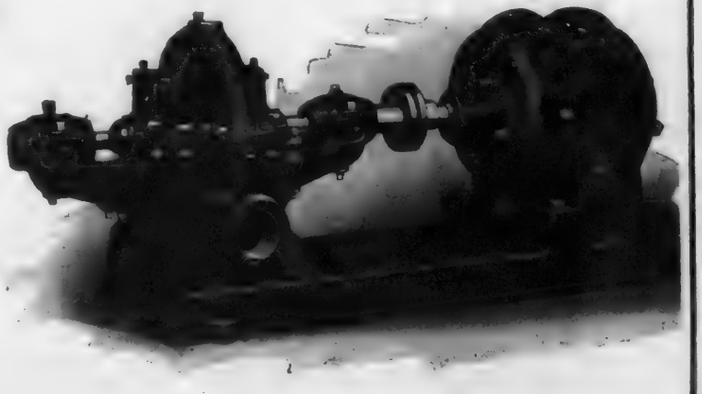
Efficient design, with many features of construction, gives Buffalo Class "S" Pumps that long life that makes them popular with users, while quantity production enables the manufacturer of equipment or the contractor to buy them at a very low price.

Write to us NOW if you are interested in better pumps for less money.

Buffalo Steam Pump Co.

480 Broadway BUFFALO, N. Y.

"Buffalo" Class "S" Pumps



ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Co., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNERS

American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Heat Equipment Corp., Lincoln, Neb.
Ideal Rotary Burner Co., York, Pa.
Johnson Co., S. T., Oakland, Cal.
Rayfield Mfg. Co., Chicago, Ill.

OZONE APPARATUS.

United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR HANGERS.

Frank Radiator Bracket Co., Chicago, Ill.
Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., New York.
Massachusetts Blower Co., Watertown, Mass
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STOKERS

CombustiKator Co., Chicago, Ill.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Pipe

Spray Engineering Co., Boston, Mass.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.

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AUTOMATIC ELECTRIC

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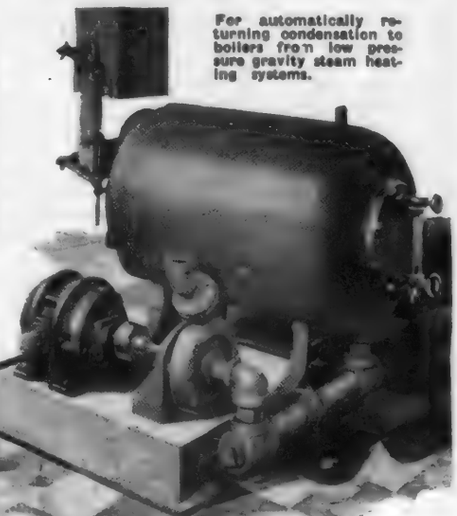

For automatically returning condensation to boilers from low pressure gravity steam heating systems.

Also manufacturers of Bilge Pumps, Centrifugal Pumps, Sewage Ejectors, Sewage Pumps, etc.

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BROTHERS COMPANY
1421 Dayton St., Chicago

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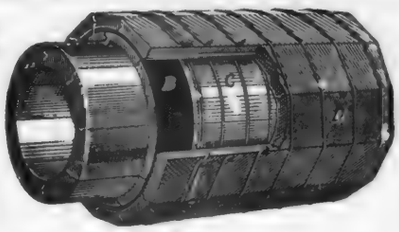
Cypress
Covering



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A. WYCKOFF & SON CO. ELMIRA, N. Y.

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Crosshead-
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Expansion Joint
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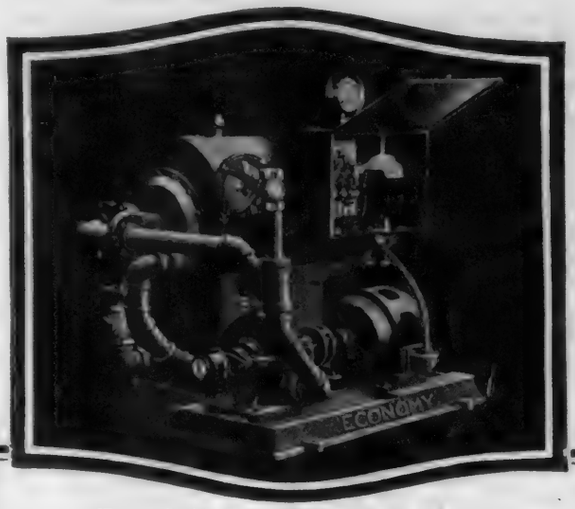

Type C. V. Fig. 2234—Single Model
Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

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They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.
71-122 North Curtis St. CHICAGO

ENGINEERS' SPECIFICATION INDEX (Continued)

Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

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Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.

(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park. Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

VENTILATORS.

Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Dickinson Co., Aeolus, Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.

Dickinson Co., Aeolus, Chicago, Ill.
Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

WEATHER STRIPS.

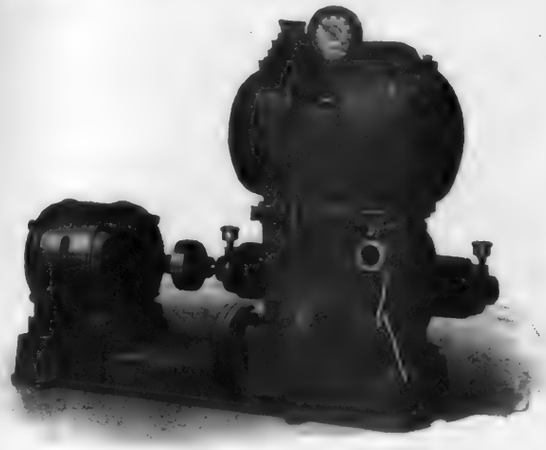
Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.

WELDING MATERIALS.

Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.

SKIDMORE



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THE Skidmore Hydro Turbine Vacuum and Boiler Feed Pump is now entering its fifth year.

Units that have been in service four heating seasons show the same efficiency that was shown when installed.

The new type offered retains all the advantages of those now in service, the change in design being in the casing to secure a more compact and sturdy unit.

All parts are of high grade cast iron or bronze, accurately machined.

There are no close clearances on moving parts and no piping is required to set the unit.

A self-contained unit all on one base.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or with automatic control

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

Chicago Pumps *are right!*

SPECIAL conditions require special types of pumps.

Rather than furnish a make-shift outfit, we refrained from offering our Vertical Condensation Pump until we had developed a unit that would do its work thoroughly and dependably. The varying temperatures of waters handled by the Condensation Pump make it unwise to use any but a specially designed outfit.

The Vertical Condensation Pump pictured above, is especially adaptable where return lines are below the floor level. The pump pit with its objectionable features, flooding, inaccessibility, etc., are completely eliminated and a great amount of floor space is saved.

The outfit is self-contained and assembled properly so that steam leaks are eliminated. Special oilless bearings are used which withstand excessive hot water and no lubrication for long periods. The float mechanism in the stuffing box is guaranteed not to stick.

Bulletin No. 133 describes this outfit in detail and gives a complete table of capacities and pressures.

In addition to the Vertical Condensation Pump, we manufacture a complete line of horizontal condensation pumps in capacities up to 150,000 sq. ft. direct radiation and for pressures up to 200 lbs.

Chicago Pump Co.

Quality Centrifugal Pumps

2325 Wolfram St., Chicago, Ill.

H&V-11-25-RM

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Save Coal—Prevent Condensation

INSULATE ALL ROOFS

ABOVE—DELTA STAR ELECTRIC CO.
Chicago, Ill. Insulated with 1" Lith.
Arch. & Eng.—Frank D. Chase, Chicago

Save Radiation Surface

ALWAYS USE INTERNAL CONDUCTIVITIES, not air to air conductivities when figuring proper thickness for roof insulation. ASK US WHY?

Union Fibre Co., Inc.

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Oil City Boilers

Burn Any Kind of Fuel

Built of Steel, in Accordance with the A. S. M. E. Code

In addition to their efficient operation and low maintenance cost, Oil City Boilers are adaptable to the use of any kind of fuel, with perfect safety and the assurance of securing the maximum amount of heat therefrom. Large fire boxes insure ample combustion space in which the heat-giving gases and the air mix freely.

Oil City Boilers, being built of steel, reduce insurance risk and assure great strength and longevity. In one unit, they comprise all the elements of a modern plant for steam or hot water heating. Self-contained—all in one—ready to set up and operate.

Built on over 45 years of sound, practical experience in the manufacture o high grade boilers.

Let us send Catalog H-9

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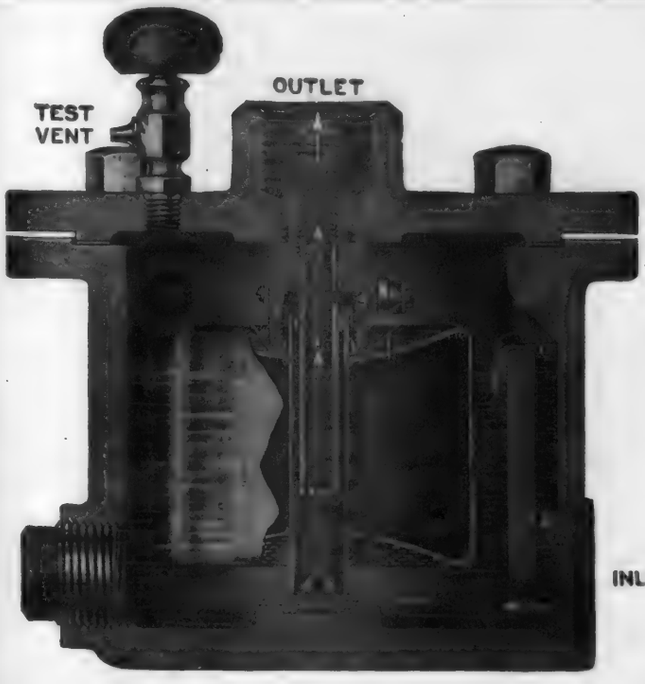

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DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

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PACIFIC
STEEL RESIDENCE BOILERS

for Bungalows, Homes, Small Apartments

for Steam, Vapor, Hot Water

for Hard Coal, Soft Coal, Gas, Oil

Hot Water Type

BUILT of steel with all joints electrically welded to stand up under the hardest usage, Pacific Residence Boilers give absolute protection against leaks and cracks and the consequent shutting down for costly repairs in the dead of winter.

The Pacific Residence Boiler is a steel firebox return tubular boiler of exactly the same design and construction as the larger Pacifics that are cutting heating costs in thousands of our largest buildings. Still the largest size completely assembled can be taken through an ordinary door.

With a Pacific in the basement the necessity of using high priced fuel is done away with for the oversized combustion chamber and long fire travel permit the use of soft coal with the same efficiency as hard coal. The Pacific is also unusually well adapted for burning oil or gas. Send for complete information.

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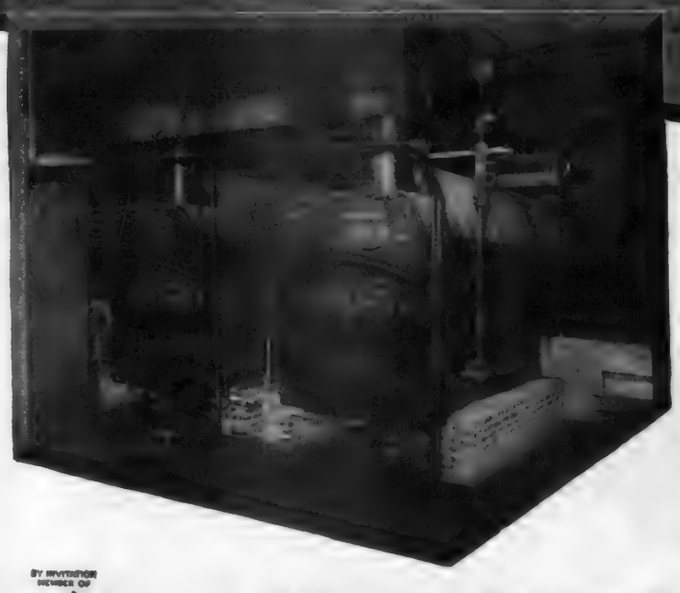
TRADE MARK REG. U.S. PAT. OFF. STEEL HEATING BOILER PACIFIC WAUKEGAN ILLINOIS

KEWANEE

heats entire city block

Steel (riveted) Firebox Boilers with water tube grate built-in at the factory have circulation that's unbeatable for burning oil.



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Two No. 318 Kewanee Down-Draft Boilers
12,000 Square Feet Radiation Each, Rated Capacity
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Gurney Sectional Boilers

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900 Series

No. 935 STEAM BOILER
Also for Water

As a result of unusual exhaustive tests to eliminate the defects usually found in push nipple square sectional boilers, the 900 Series Boilers represents the embodiment of many advantages not found in other boilers.

Low water line meets requirements where head room is limited.

Made in four widths of grates covering a wide range of sizes, suitable for both small requirements as well as the larger class of work requiring a batery of two or more boilers.

Generous grate areas, large prime fire surfaces and unusual coal carrying capacity. Highest grade pig iron is used to produce greatest tensile strength. Steam boilers have liberal steam space.

Well arranged heating surfaces, ample flue areas, ease in cleaning, rocking and dumping type grates, all help in giving the owner economical and satisfactory service.

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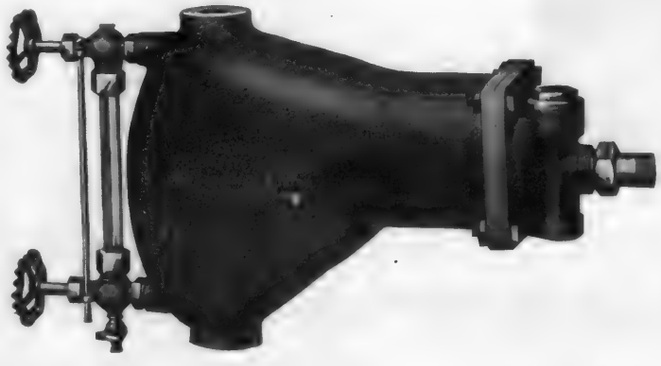

Equip your Low Pressure Boilers with a Thermoflex Automatic Feeder. Especially if it is a Vacuum or Vapor System or the Boiler is Oil Fired.

AUTOMATIC IN OPERATION
WILL NOT FLOOD
BEST INSURANCE

Send for complete bulletin catalog describing this and other Thermoflex Products.

Manufactured by

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WE HAVE A FEW DESIRABLE TERRITORIES STILL OPEN FOR REPRESENTATION

2828 Pine Grove Ave., Chicago.
Lowenberg & Lowenberg, Architects.

Heated with Kewanee Boilers equipped with Wolff Draft Conditioners.

Wolff
Draft Conditioners

Sold on a positive fuel-saving guarantee. And they "make good"

Every Wolff Coal Saver is sold on a positive *written guarantee* to save fuel, whether coal or oil is used. If they didn't make good we would be out of business—but we are going stronger than ever. Right here in Chicago more than **5300 installations prove they do everything we say they will.**

Wolff Draft Conditioners *save fuel* because they regulate the amount of air passing through the boiler according to the amount required, as determined by the temperature.

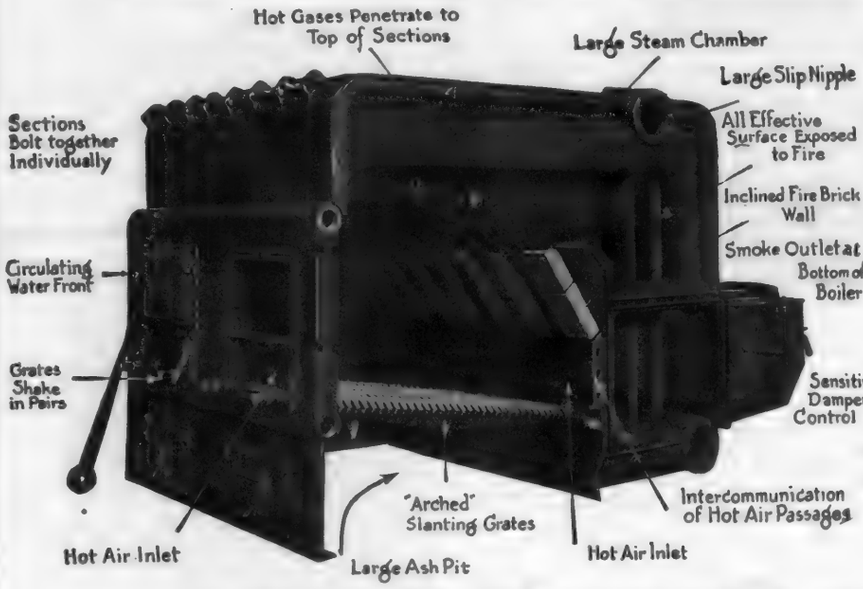
Furthermore, they hold the hot gases in the boiler long enough so that the water in the boiler has a chance to absorb the heat. *Less heat goes up the stack*—hence considerable fuel is saved.

Heating Contractors can make money selling them

Wolff Coal Saver Co.

1336 West Congress St., Chicago

Ask Us Why It's Economical to Use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Sections Bolt together Individually
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A correct application of heat, over both a direct fire surface and a large amount of indirect surface, is necessary to an efficient boiler.

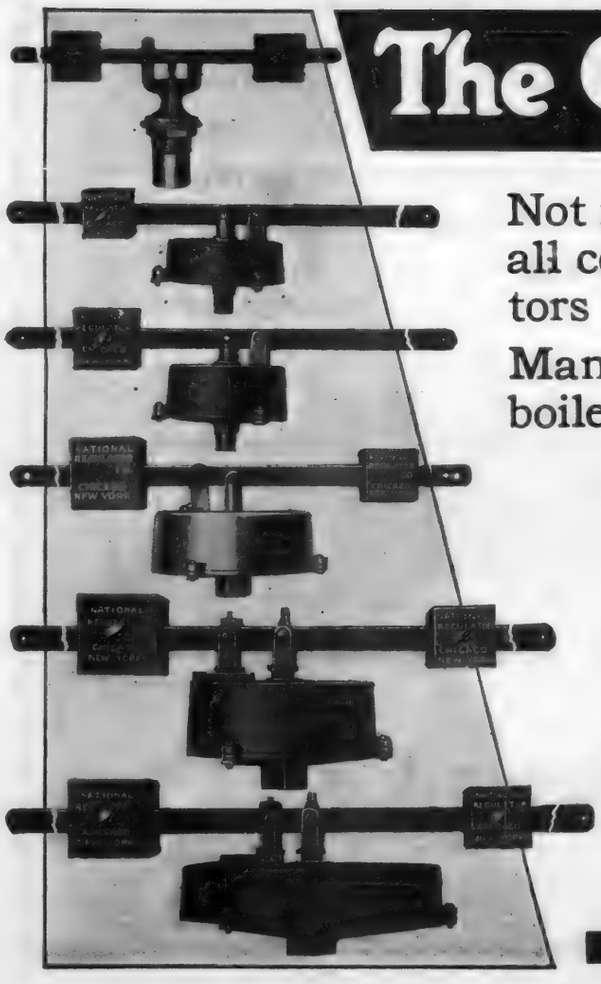
The result of complete combustion, assured — no matter what the fuel—by plenty of fresh, pre-heated air is almost entirely useful steam.

Waste gases enter the smoke pipe free from smoke and, even more important, comparatively cool.

NIAGARA RADIATOR & BOILER COMPANY

General Office and Factory—North Tonawanda, N. Y. Branch Office and Factory—Chicago, Ill.

NIAGARA LOW WATER LINE SMOKELESS **BOILERS**



The Complete Line

Not merely one regulator to cover all conditions but a line of regulators to meet every requirement.

Manufacturers of the better boilers have standardized on

METAPHRAM DAMPER REGULATORS

Metal Diaphrams—Last the life of the boiler

For Low Pressure Steam—Vacuum—Vapor or Hot Water. Smallest to the largest Boilers.

Write for catalog—if your jobber cannot supply

NATIONAL REGULATOR CO.
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The A Jacks People (A Jacks for High Pressure)

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INTERNATIONAL HEATERS

GOOD INVESTMENTS

What will the New Year bring?

Somehow—we like to look forward to 1926 with the cheerful thought in mind that here is a brand new possession—something we can cherish as a valuable gift.

INTERNATIONAL dealers are well satisfied with 1925. Early in the year they insured an inventory of profits by renewing their resolution to use INTERNATIONAL Heaters exclusively.

What will 1926 bring to you? A resolution to insure a year's good business and real profits? A decision to use INTERNATIONAL Heaters for every heating job?

We hope so—and will be glad to help you decide.

SUPPORTING MEMBER

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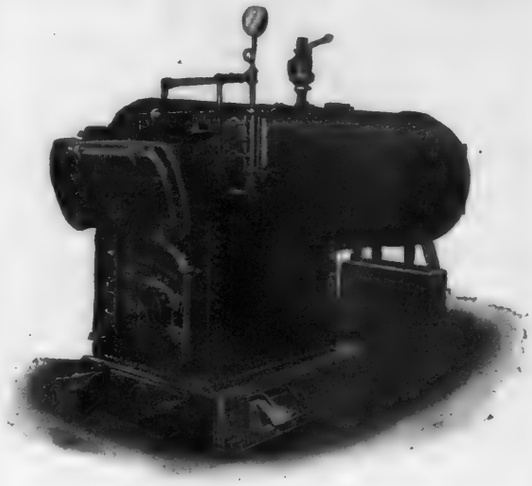
AMES
Firebox Heating Boilers



Ames Firebox Heating Boiler with Plain Furnace

Built with Plain and Downdraft Furnaces. Incorporating the Latest and Most Advanced Ideas in Boiler Design and Construction.

We also build a complete line of Horizontal Tubular, Upright and Empire Boilers for Heating and Power Requirements.

Bulletins with complete details mailed on request.

Empire Return Tubular Portable Boiler

AMES IRON WORKS
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How to get more business!

HANG the Thrush poster in your window. Put a working Thrush installation in your shop on your own plant. Put a model installation in your window. Send out the folders and attractive blotters Thrush supplies and then watch business come in.

More Profit in it!

Selling Thrush specialties brings you greater profit than any other thing in your line and it brings more real comfort and convenience to your customers.

Thrush System of hot water heating can be applied to old or new jobs with equal success and makes an automatically regulated closed system out of any ordinary gravity heating plant.

Thrush System of Hot Water Heating
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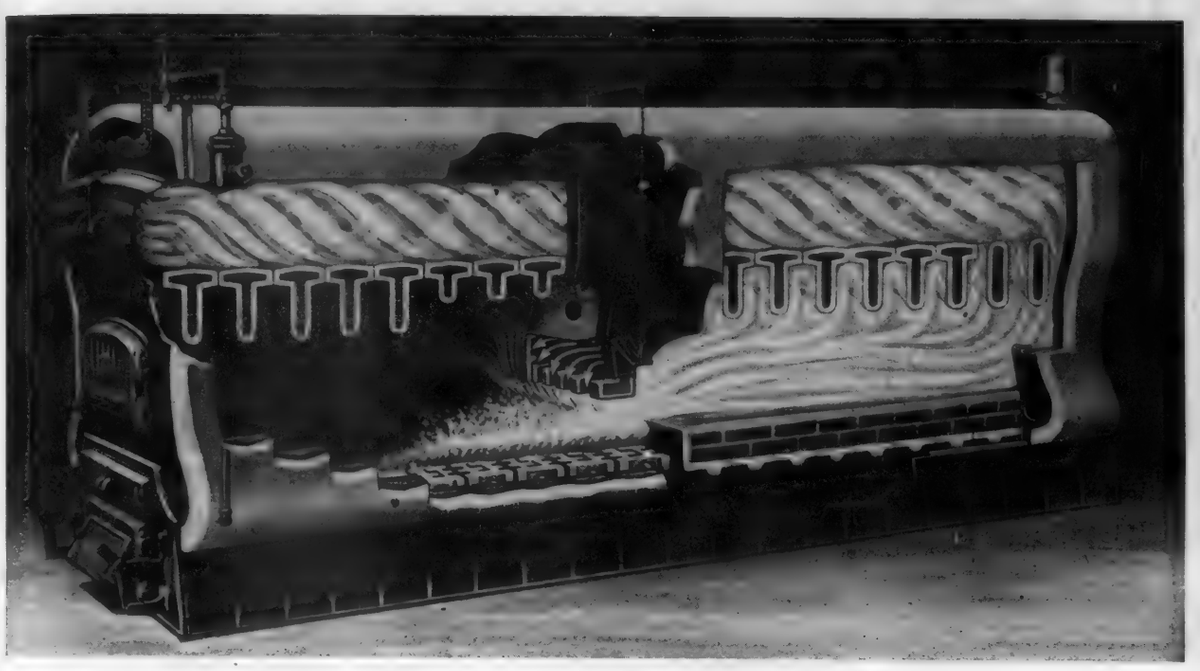

Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

Economical—Smokeless—Efficient!

A recent improvement put the Air Regulation under easy control from the front of the boiler.

Exterior View of Boiler

Utica-Imperial SUPER-SMOKELESS Boilers burn even the cheaper grades of soft coal not only smokelessly, but with economy and efficiency. Heated air is admitted to the fire on the principle of the Bunsen Burner, and smoke and soot are ignited and burned within the boiler. ALL OF THE FUEL IS UTILIZED to obtain maximum efficiency with a minimum amount of coal. This means not only cheaper first costs of fuel, but a great saving in the amount consumed. Engineers and Contractors are invited to write for complete information.

Manufactured by the

UTICA HEATER COMPANY

UTICA, NEW YORK

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Titusville Horizontal Return Tubular Boilers

A type that gives long and satisfactory service.

Built with liberal allowances for safety beyond actual requirements of A.S.M.E. Code.

Stock designs and sizes—or built to specifications. Steel Casings and suspension frames furnished when required.

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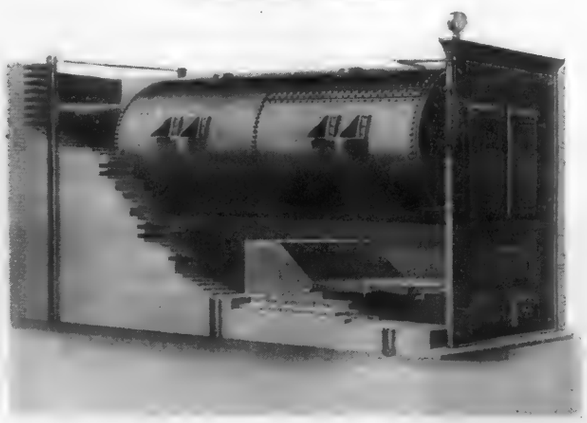

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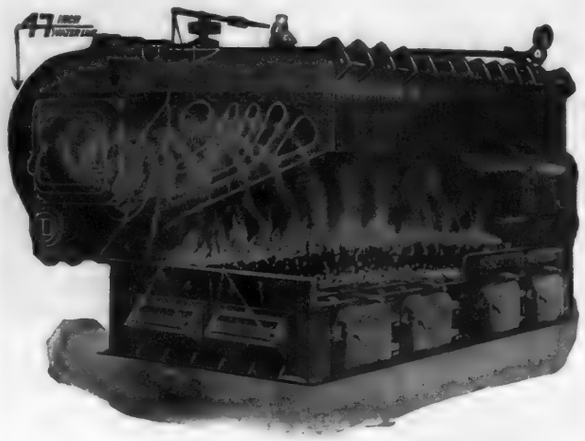
BOILERS AND RADIATORS



Continental Low Water Line Boiler Reliability doesn't "just happen"

THE reliability of Continental Low Water Line Boilers begins at the factory.

Every part of every boiler is first inspected as it is machined. Then every boiler is completely assembled and tested under pressure before shipment. They set up easily and free from leaks on the job.

Immediate shipments from large reserve stocks maintained at the factory give flying starts to rush jobs.

Quick assembly—right the first time—assures a fast finish a lap ahead of the time limit.

Insure your profits with Continental Low Water Line Boilers.

Continental Heater Corporation
Home Office and Factory
Dunkirk, N. Y. U.S.A.

BUILT FOR BETTER HEATING

Equipped with Automatic Hot Water Damper Regulator; Hot Water Relief Valve Set at 80 Lbs., Two Brass Cleanout Plugs in Front, etc.

When You Want Economy Proof

It's easy enough to claim economy; that's why everybody does it. It's not so easy to furnish the proof of economy performance. That is why we ask you to write for the full facts about the

Burnham

Water Tube Type Boiler

It is built for hot water supply heating. A high pressure boiler tested at 2½ times its working pressure; guaranteed for 80 lbs.

No large areas of flat surfaces; they are corrugated. Three times back-and-forth fire travel—another distinctive Burnham feature. Automatic damper regulator, hot water relief valve, brass clean-out plugs, etc. Better send for the catalog and other performance proofs that will show you how to capture the hot water supply business of apartment houses, hotels and other large buildings.

Burnham Boiler Corporation

IRVINGTON, N. Y.

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PAGE BOILERS

"The Distinguished Service Line"

Ratings of Page Boilers have not been changed. They are derived from careful and exhaustive tests, during years of service under every condition, which proved their safety.

We have a complete stock of all sizes of boilers, including our new 60 inch Monarch, and can make **immediate shipment.**

Monarch Smokeless

Volunteer (steam)

Volunteer (water)

Monarch (header type)

THE WM. H.
PAGE BOILER CO.

58 West 40th Street
NEW YORK

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PHILADELPHIA

CLEVELAND
MEADVILLE

Established 1856 Incorporated 1877

In logging camps and automobile factories in mines and steel plants you will find the oxy-acetylene torch at work with

Prest-O-Lite
DISSOLVED ACETYLENE

THE PREST-O-LITE COMPANY, INC.
Oxy-Acetylene Division
General Offices: Carbide and Carbon Bldg., 30 East 42d St., New York
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31 Plants—71 Warehouses—22 District Sales Offices

Type of Buildings In Which Universal Gas and Coal Boilers Are Installed

TYPICAL installation of Universal smokeless coal and gas boilers cross connected to the same heating system.

This type of boiler installation is the most satisfactory, the most efficient, the most economical that money can buy.

The gas boiler operates automatically, maintaining every room in the house at a uniform comfortable temperature *at all times*, without practically any care or attention on the part of the owner.

If the supply of gas gets too low or the gas bill too high in the coldest weather, the gas boiler can be shut off and the smokeless coal boiler operated.

Universal smokeless boilers comply with the law and are guaranteed to pass your smoke ordinance, whether fired light or heavy. The smokeless feature is fool-proof. Anyone can fire or operate the Universal double grate, down-draft smokeless boiler.

Ask your heating contractor.

UNIVERSAL SMOKELESS BOILER CO.

RAVENNA, OHIO

The Effect of Scale on Pipe

The Scale on Ordinary Pipe Means

Increased corrosion—especially pitting
Greater friction loss
Less delivery capacity
Poor base for galvanized coating
Valve seats damaged and small orifices clogged

"NATIONAL" SCALE FREE Pipe Means

Minimized corrosive tendencies—particularly pitting
Less friction loss
Full delivery capacity
Good base for galvanized coating
No scale to damage valves or clog small openings

IN ADDITION to the Spellerizing (roll-knobbling) process applied to all "NATIONAL" Pipe, sizes 4-inch and under, all butt-weld pipe, sizes ½ to 3-inch, is made by the SCALE FREE Process. In this process the mill-scale, or welding-scale, ordinarily found on butt-weld pipe is removed by a special rolling operation, which gives a clean, smooth surface both outside and inside the pipe. Our Bulletin No. 7 illustrates and describes the process of manufacture and explains the advantages of SCALE FREE Pipe; plumbing and heating contractors will find this bulletin interesting and valuable.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

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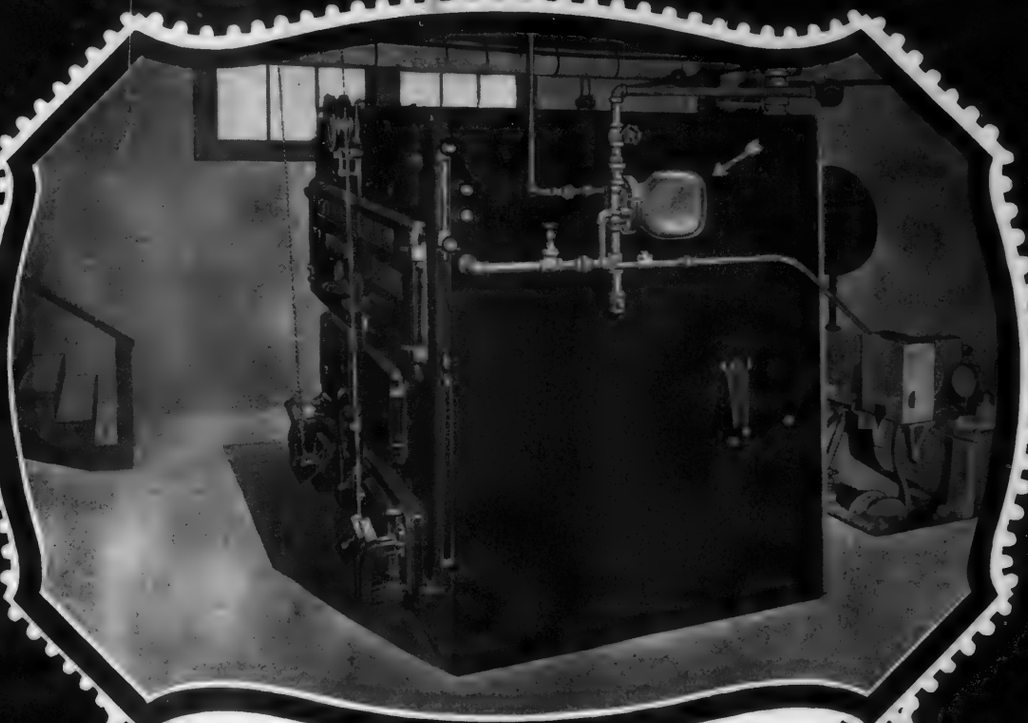

—and the Pump Failed

Suppose the current fails and the pump is rendered inoperative—what about the boiler water line?

If there is a McDonnell & Miller Duplex Water Feeder on the job, there's no need to worry, for it goes right along putting just the right amount of water in the boiler until the pump is again in operation.

And, more than that, the McDonnell & Miller Duplex Water Feeder prevents a flooded boiler when the condensate, which has been held up by the pump, returns to the boiler.

The McDonnell & Miller Duplex Water Feeder does away with 95% of all boiler trouble. It is applicable to any kind of low pressure steam boiler, and may be used with any kind of fuel.

It is an engineering product—the sole item of manufacture of an engineering organization. You can't afford *not* to know about it. Ask for Bulletin H-3.

McDONNELL & MILLER

"DOING ONE THING WELL"

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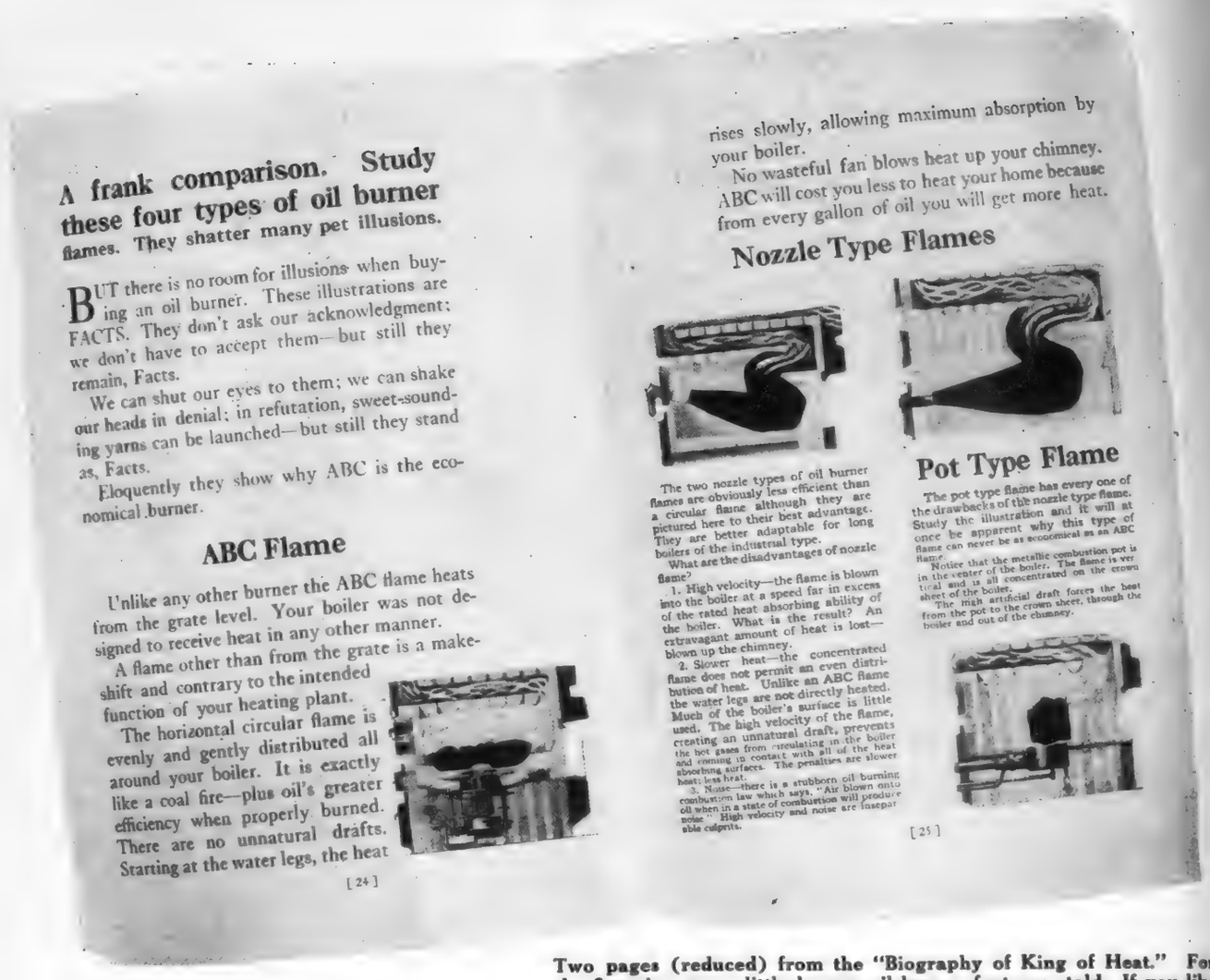
Eastern Warehouse Stock
BUSH TERMINAL
NEW YORK



A frank comparison. Study these four types of oil burner flames. They shatter many pet illusions.

BUT there is no room for illusions when buying an oil burner. These illustrations are FACTS. They don't ask our acknowledgment; we don't have to accept them—but still they remain, Facts.

We can shut our eyes to them; we can shake our heads in denial; in refutation, sweet-sounding yarns can be launched—but still they stand as, Facts.

Eloquently they show why ABC is the economical burner.

ABC Flame

Unlike any other burner the ABC flame heats from the grate level. Your boiler was not designed to receive heat in any other manner.

A flame other than from the grate is a makeshift and contrary to the intended function of your heating plant.

The horizontal circular flame is evenly and gently distributed all around your boiler. It is exactly like a coal fire—plus oil's greater efficiency when properly burned. There are no unnatural drafts. Starting at the water legs, the heat rises slowly, allowing maximum absorption by your boiler.

No wasteful fan blows heat up your chimney. ABC will cost you less to heat your home because from every gallon of oil you will get more heat.

[24]

Nozzle Type Flames

The two nozzle types of oil burner flames are obviously less efficient than a circular flame although they are pictured here to their best advantage. They are better adaptable for long boilers of the industrial type.

What are the disadvantages of nozzle flame?

1. High velocity—the flame is blown into the boiler at a speed far in excess of the rated heat absorbing ability of the boiler. What is the result? An extravagant amount of heat is lost—blown up the chimney.

2. Slower heat—the concentrated flame does not permit an even distribution of heat. Unlike an ABC flame the water legs are not directly heated. Much of the boiler's surface is little used. The high velocity of the flame, creating an unnatural draft, prevents the hot gases from circulating in the boiler and coming in contact with all of the heat absorbing surfaces. The penalties are slower heat; less heat.

3. Noise—there is a stubborn oil burning combustion law which says, "Air blown onto oil when in a state of combustion will produce noise." High velocity and noise are inseparable culprits.

Pot Type Flame

The pot type flame has every one of the drawbacks of the nozzle type flame. Study the illustration and it will at once be apparent why this type of flame can never be as economical as an ABC flame.

Notice that the metallic combustion pot is in the center of the boiler. The flame is vertical and is all concentrated on the crown sheet of the boiler.

The high artificial draft forces the heat from the pot to the crown sheet, through the boiler and out of the chimney.

[25]

Two pages (reduced) from the "Biography of King of Heat." For the first time some little known oil burner facts are told. If you like the truth, without sugar-coating, this booklet will appeal to you.

ABC wants live dealers

When you take the exclusive agency for an oil burner you will shun the untested devices—you don't want to pay the manufacturer's experimental expenses.

ABC is a pioneer. Five years old—over 5000 installations. Over $200,000.00 has been spent in perfecting ABC since the first burner was sold.

ABC today is more than just another oil burner. It is the only burner that retains the natural functions of a coal burning boiler. That's why ABC is a fuel saver.

Investigate Now

Tomorrow the exclusive agency for your territory may be closed. All progressive heating men know that oil burners are in demand. The only reason they have not taken on a burner is because they have not found one they like. ABC talks their language; they understand it.

"The Biography of King of Heat" gives the facts, unsweetened. Write for it today.

Listed as Standard by Underwriter's Laboratories.

AUTOMATIC BURNER CORPORATION
312 North May Street, Chicago

ABC OIL BURNER

no noise ~ no carbon

HANDON

The Best Advertiser

of any product is the *satisfied user*. There are many thousands of such *voluntary* advertisers of Handon Boilers in our distributing territories. *They are satisfied* because Handon Charcoal Iron Boilers and Heavy Duty Tank Heaters do even more than we claim for them.

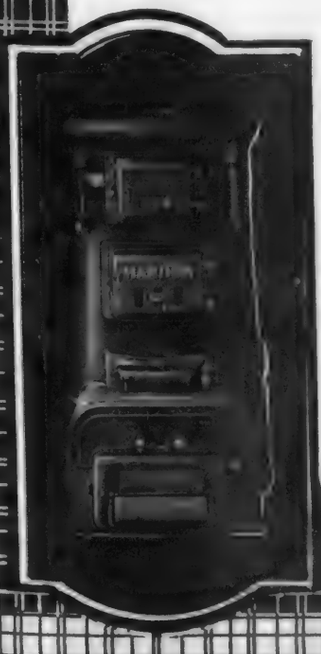
There are features to our boilers about which *you should know*—the superior charcoal iron casting, the full grate area, the full size of the boiler, the *radial arms* on the *crown-sheet* that give direct circulation of the water over the rays of the fire, giving immediate contact and quick steam or hot water.

Save time, trouble, and money.

When you assemble the boiler and come away from the job, after you have put on your test, you know *certainly* that you have given your customer *full value* and *a real heating job.*

Handle the Handon, and join the Handon Boosters.

Send for catalogue and discount sheet.



HANDON BOILER CORPORATION

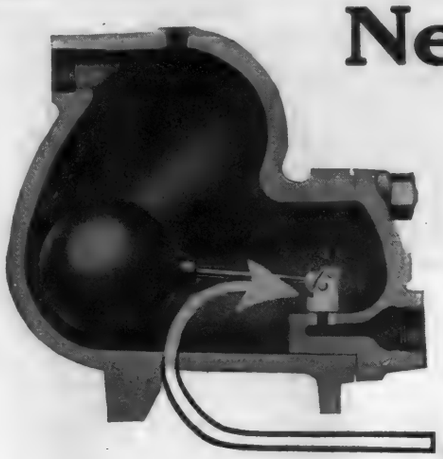
General Sales Office:

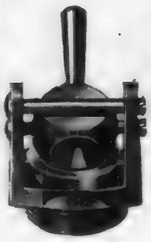
101 Park Avenue
NEW YORK CITY

Foundry:

Poughkeepsie, N.Y.

HANDON





New—and Different

But the result of years of good steam trap making

Two years ago, we added the new patented Paracoil valve to an already well known steam trap. The result was a highly efficient trap so simple it had only one moving part, and so rugged that it defied wear.

Many large concerns were enthusiastic over it from the start and have since adopted Paracoil as standard. They find that maintenance expense is practically unheard of. In fact, the Paracoil is guaranteed against repairs for two years. The construction and operation of the Paracoil valve are radical improvements over ordinary practice.

The recessed valve ball which is a special alloy of aluminum bronze does not lift, but rotates over the port, thus assuring long wear and a tight contact. Special construction makes it impossible for the float to chafe or touch the body of the trap. Thus freedom from repair is an easy thing to guarantee.

That the Paracoil has proved itself is evidenced by the long list of big companies who are repeating their orders for Paracoil Steam Traps.

You can save big money and end steam trap trouble with a Paracoil. Fill in the attached coupon and procure our steam trap catalog.

Paracoil
STEAM TRAPS

Davis Engineering Corp.
90 West St. New York
Factory Elizabeth, N. J.

A Few of the Concerns who are Successfully Using Paracoil Steam Traps:

Interborough Rapid Transit
Equitable Building
Borden Company
Consolidated Gas—Brooklyn
Dupont
Postum Building
Argentine Government, Oil Refining
American Smelting and Refining
Bethlehem Steel Company
Naval Air Station—Pensacola
Public Service of New Jersey
Teachers College, New York
General Carbonic
American Sugar Refining Company
Toluol Products

DAVIS ENGINEERING CORP.,
90 West Street, New York.

Kindly send catalog covering the Paracoil Steam Trap.

Name .....

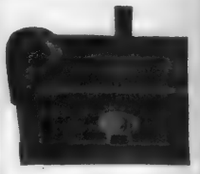
Address .....

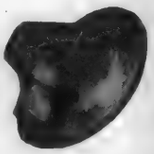
City ..... State .....

THE FRANK

Double and Single
Wall Radiator Bracket
(PATENTED)

Ceiling Hanger
With Locktight Nut, Washer
(PATENT APPLIED FOR)





ONLY ONE BOLT

required for Frank Brackets. The double bracket saves wall space and one-half the runs of pipes and valves are required.

Frank Radiator Brackets, designed by John C. Frank, a steam-fitter of long experience, are the easiest to install and permit of greater horizontal and vertical adjustment. The money and time saving features of the Complete Frank Line are fully described in our Pocket Size Catalog. Every engineer and contractor can use it. Please ask for it.

Special Brackets made to order.

The Frank Radiator Company
30 No. LaSalle Street, Chicago

This ceiling hanger does away with unsightly trapeze hangers.

Single Wall Brackets.

Adjustable Hook Plates.

Adjustable Steel Inserts.

Coil Spreaders and Hangers.

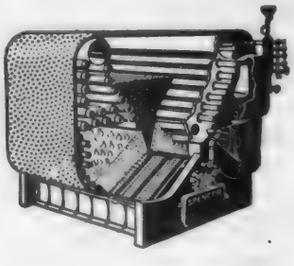
Now, while the anthracite coal strike is fresh in their minds, you can sell your prospects a SPENCER HEATER by reminding them that they can always, regardless of strikes, get No. 1 Buckwheat at from $4 to $7 less per ton than the domestic sizes that are so quickly unavailable when a shortage exists.

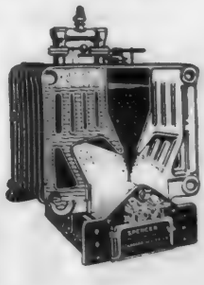
Spencer

steam, vapor or hot water

Heaters

burn No. 1 Buckwheat coal





A size and type for every purpose *Sold only through heating contractors*

STANDARD HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Lancaster Detroit Schenectady Syracuse Harrisburg Scranton Washington

Could you doubt the judgment of these prominent architects and engineers?

Men who have such a high standing in their profession as the following, and hundreds of others who have recommended Sarco Steam Traps, are not accustomed to specify anything unless they *know*, beyond doubt, that it is the very best in its line. When they write "Sarco" into specifications, they are *sure* their clients will get perfect satisfaction.

Isn't a steam trap endorsed by such men worthy of your investigation?

Almirall & Co.
L. A. Abramson
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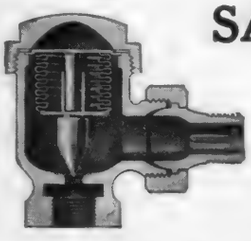
Our booklet P-128 gives some interesting information. Write for a copy.



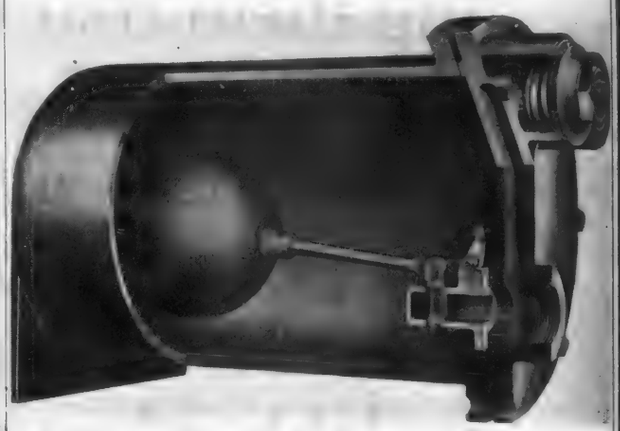
SARCO CO., Inc.
231 Broadway
New York City

Boston Chicago
Buffalo Cleveland
Detroit Philadelphia
Peacock Bros., Ltd., Montreal

SARCO
RADIATOR TRAP

The Barnes & Jones BLAST TRAP

Accessibility
Simplicity of Design
Sturdiness of Construction



THE body and head of the Barnes & Jones Blast Trap are of cast iron. The valve and working parts are of the best grade steam bronze. Because both inlet and outlet piping connections are made to the head of the trap, it is not necessary to disturb any piping should it be advisable to clean the trap. By removing the bolts, the body can be pulled away from the head, thus having all working parts exposed to view.

This trap is for use at any point where sudden loads occur, such as with vento heaters, aerofin, or important drip points from large mains, etc. It has a thermostatically controlled air vent.

This trap was designed upon our previous extensive experience which conclusively proved that the most important features of a Blast Trap were Simplicity, Accessibility and Sturdiness.

Barnes & Jones Traps embody these three points and therefore insure absolute freedom from repairs.

Barnes & Jones

Vapor and Vacuum Heating Systems
of Proven Quality

5 Melrose Street Boston

INSIDE HOPPER
GRAVITY FEED

COKAL COMBUSTIKATOR

CORRECT COAL BURNING ASSURED

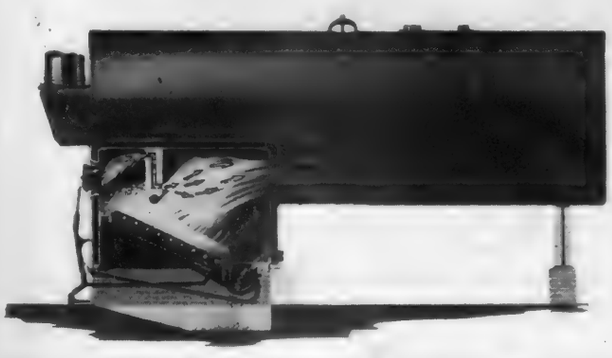
The Ultomatic Coal Burner

Revolutionary in simplicity, efficiency and smokelessness, the CombustiKator is acclaimed by architects, consulting engineers, smoke inspectors and contractors as a solution to the coal burning problem. It is being recommended by boiler manufacturers. It meets all smoke ordinances. It improves the performance of boilers. It is absolutely fool-proof. It is accomplishing extraordinary economies.

How the CombustiKator Works. The fireman throws the coal through door against the arch wall. The valuable volatile is driven off and passes through the passage in the arch, is preheated and burned in the combustion chamber. The coke that is left is fed down the grate and the ash is dumped at the end of the grate by an occasional pull of the lever by the janitor or fireman.

The Natural Way to Burn Coal. The CombustiKator burns gas and coke instead of burning the green coal. The result is a smokeless fire with an efficiency that is impossible even with the most expert hand firing.

Eliminates All Cleaning Periods. Hand cleaning of fuel bed is eliminated. There is no rush of cold air through firing doors during firing, or any other time. There are no holes in the fire as the coke is always spread evenly over the grate from the internal hopper. This is another coal saving feature of CombustiKator. Burns all sizes of coal.



CombustiKator installed in Kewanee Boiler, showing inside hopper, method of coking coal and pre-heating volatile, etc. A combination gas producer and mechanical stoker, the CombustiKator is the simplest, most efficient and most perfect "method" yet devised for burning coal.

Owners Like CombustiKator. Building maintenance is cut down both by using cheap bituminous coal burned efficiently and by employing cheaper help in the boiler room.

Architects Like CombustiKator. Architects like the assurance of well and cheaply heated buildings no matter what class of help is employed.

Consulting Engineers Like CombustiKator. Consulting engineers realize that the CombustiKator gives scientific and smokeless combustion in low pressure boilers for the first time.

Firemen Like CombustiKator. CombustiKator cuts out the drudgery and hazards of cleaning fires—eliminates criticism of smoking chimneys and makes the fireman proud of saving the coal pile. They like the quick pick up that follows a pull of the lever.

Boiler Manufacturers Like CombustiKator. Boiler manufacturers endorse and recommend the CombustiKator because it improves the performance of their boilers.

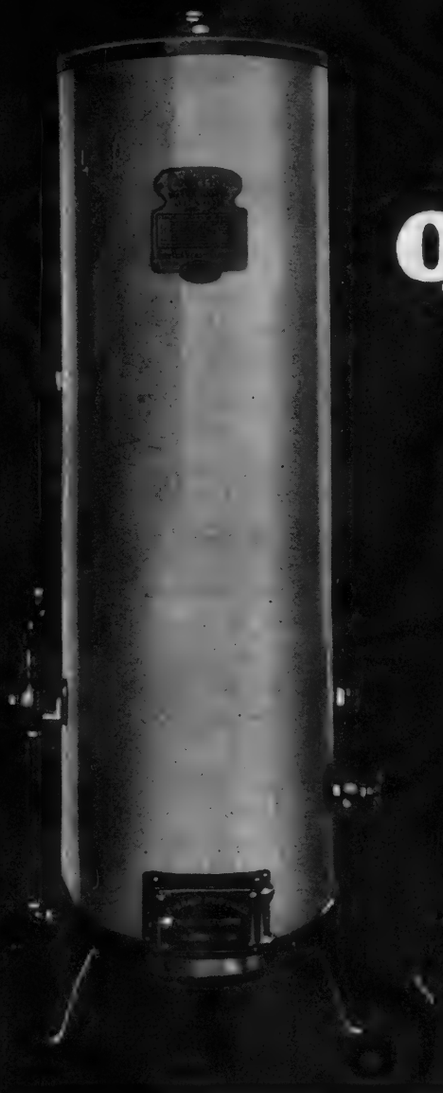
Adaptable to All Low Pressure Boilers. Either locomotive firebox or return tubular boilers work perfectly when equipped with the CombustiKator. No boiler can smoke that is CombustiKator equipped. CombustiKator is neither expensive to buy or to apply to any standard boiler.

Responsibility of CombustiKator. CombustiKator is manufactured, engineered and guaranteed by a corporation with nation-wide organization and undoubted financial standing.

Send for the facts, specifications for standard boilers, terms, etc.

CombustiKator Company

1014 Wrigley Building, Chicago



The Quality Heater with a Clean Profit

EverHot
AUTOMATIC
WATER HEATER

YOU can figure to a cent your net profit on an EverHot Heater the day the heater is sold. Your profit is a clean one. There are forty-two EverHot distributing offices in the United States. Each office carries stock and renders sales and engineering service. This broad organization exists for the purpose of serving the plumbing trade of the country on EverHot Heaters. When the heater is installed our organization takes the responsibility for its satisfactory operation. We see to it that every user is a booster.

EverHot Heater Co.

5215 Wesson Ave.—Detroit

Canadian Distributor—Riley Engineering & Supply Co.—Toronto, Canada

IDEAL Gas Boilers need "firing" but twice a year.

A snow shovel is the only kind he uses

TWO "FIRINGS" a year—Fall and Spring—sounds mighty attractive to householders accustomed to three firings a day—morning, noon, and night.

The workless luxury of IDEAL Gas Boilers has banished coal shovels, ash cans, and canvas gloves from many homes. That's why they are so easy to sell.

And IDEAL Gas Boiler profits are *yours to keep.* The local gas company is not only your jobber but your "Service Department" as well. Its competent service force systematically maintains equipment installed on its lines. What other form of non-solid fuel device offers this advantage that means so much to your profits and your good-will?

IDEAL Gas Boilers are tested and rated under AGA Code. Capacity required, therefore, is only 25% in excess of total condensing load (including piping). Efficiency attained is more than 85%.

Write us, or see your gas company, for details of the IDEAL Gas Boiler selling plan and comparative cost data.

THE A. H. WOLFF GAS RADIATOR COMPANY

Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street Dept. G 78 New York City

Combination Hot-Water Heating

Home in Germantown, Pennsylvania

Heat as needed

THIS house in Apsley Street, Germantown, Pennsylvania, is provided with Clow Gaswater Radiators in the Living Room, Dining Room and Bath Room.

In the fall and spring, these radiators provide ample heat for the entire house. During these seasons, they supply their own hot water. In extreme cold weather, the Clow Gaswater Radiators are thrown into the standard heating system and function as ordinary radiators.

Combination Heating provides heat for offices or homes when and where it is wanted. If the boiler is shut down, it is only necessary to turn the valves, strike a match and light the Clow Radiators.

Clow Gaswater Radiators can be furnished fitted for all standard systems. Also Clow Gasteam Radiators for either vacuum or vapor, one or two pipe steam systems.

JAMES B. CLOW & SONS
534-546 S. Franklin St., Chicago
Sales Offices in Principal Cities

(Each Radiator an Independent Heating Plant)

CLOW
GASTEAM — GASWATER

SERVICE WATER
For The
FORD TWIN CITY PLANT

Engineers in considering the service water requirements for the new Ford Twin City Plant made two important decisions.

The first decision was somewhat unusual. They recommended the installation of nineteen (19) small service water heaters, each controlled by its own temperature regulator in place of the usual single or double installation of larger heaters with an equal total capacity.

The second decision was in strict accordance with the judgment of an ever increasing number of the country's foremost engineers. That is, they specified that these heaters should be Whitlock Type K Water Heaters.

This increasing tendency to rely on Whitlock Products for the solution of every heat transfer problem that arises is due to the following reasons:—

First—The exceptional experience of Whitlock Engineers in analyzing every problem of this type on its own merits.

Second—Their ability to design and manufacture apparatus which successfully solves the problem as they have analyzed it.

This same service which has been so welcomed by many engineers is also yours for the asking.

THE WHITLOCK COIL PIPE CO.
40 South Street, Hartford, Conn.

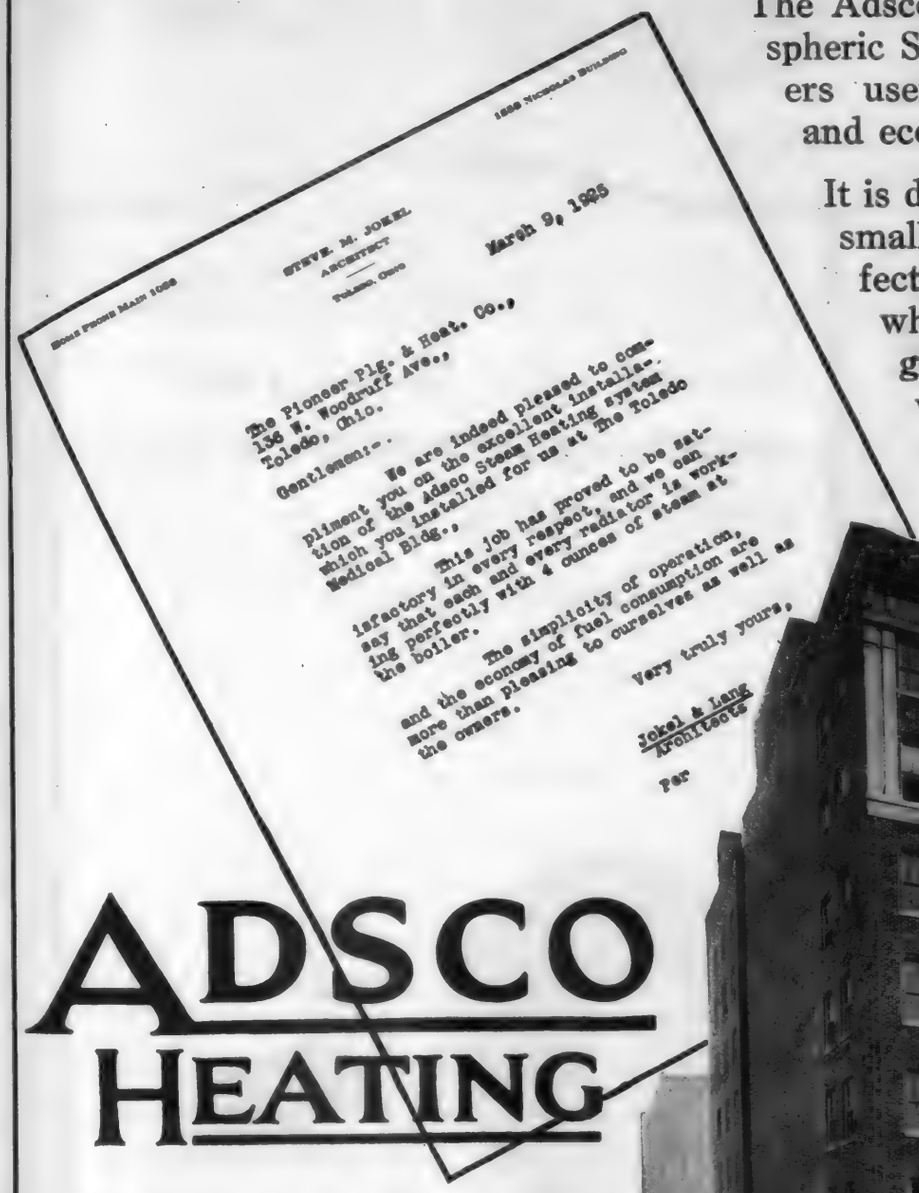
New York Chicago Boston Buffalo Philadelphia
San Francisco

WHITLOCK
HEAT TRANSFER
PRODUCTS

Need we say more?

The Adsco System of Atmospheric Steam Heating delivers useful comfort surely and economically.

It is designed down to the smallest fitting for perfect performance and when put in operation gives exact results for which the system was planned.



1555 NICHOLAS BUILDING

STEVE. M. JOKEL
ARCHITECT
TOLEDO, OHIO

March 9, 1925

The Pioneer Plg. & Heat. Co.,
136 N. Woodruff Ave.,
Toledo, Ohio.

Gentlemen:-

We are indeed pleased to compliment you on the excellent installation of the Adsco Steam Heating system which you installed for us at The Toledo Medical Bldg.,

This job has proved to be satisfactory in every respect, and we can say that each and every radiator is working perfectly with 4 ounces of steam at the boiler.

The simplicity of operation, and the economy of fuel consumption are more than pleasing to ourselves as well as the owners.

Very truly yours,

Jokel & Lang
Architects

Per

ADSCO HEATING

This instance is only one of thousands where Adsco installations have brought complete satisfaction. A page in a magazine is not enough to get across to you what Adsco Heating does.

But if it can get you to write us for Bulletin No. 181-H-9 explaining the system in detail, it will have served its purpose.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

Offices:
New York Chicago Seattle

In Cincinnati, O.

In Denver, Colo.

In Wilmette, Ill.

In St. Louis, Mo.

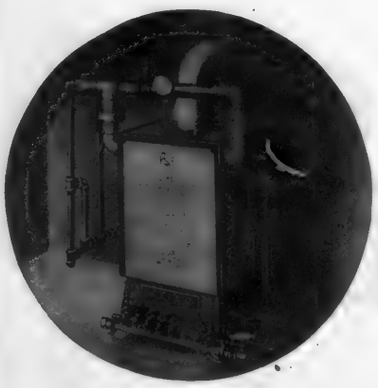
In Portland, Ore.

In Buffalo, N.Y.

—an excellent gas boiler backed up by a nation-wide organization which really strives to give you the utmost co-operation—

THE BRYANT HEATER & MFG. COMPANY
17854 St. Clair Avenue
Cleveland, Ohio

Branches in Principal Cities



Needs no more care than a pup can give it.

BRYANT HEATING

for Hot Water, Steam AUTOMATIC GAS Vapor *and* Warm Air

FROM BOILERS TO FARTHEST RADIATORS

10 Buildings—18,000 Sq. Ft. of Radiation
One Central Boiler Plant—Unit Ventilation

and the

O-E 3-IN-1 HEATING SYSTEM

Entire System Operating by Gravity—Complete Circulation on Less Than Ounce Pressure

No Vacuum Pumps
No Condensation Pumps
No Receivers
No Tilting Tanks
No Equalizing Devices
or Like Complicated
Mechanisms Required
Single or Group Buildings
O-E Renders the Maximum
in Heating Efficiency
None too Large
None too Small

MORE HEAT—LESS FUEL

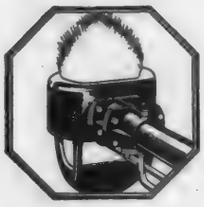
Mr. WM. GALENA
HEATING CONTRACTOR

States that after installing this and many other OE Systems that he is so convinced of the efficiency and economy of the OE 3-IN-1 System that he is willing to install an OE job, accepting a small initial payment, the balance to be derived from a part of the saving effected in the consumption of fuel.

O-E Specialty Mfg. Co.

12 Keefe Ave. Milwaukee, U. S. A.

DISTRIBUTORS:—O-E Specialty Mfg. Co., 608 So. Maple Avenue, Los Angeles, Calif. O-E Specialty Mfg. Co., 407 Market Street, San Francisco, Calif. Peerless Pacific Co., 285 Stark Street, Portland, Ore. Olympic Heating Supply Co., Colman Building, Seattle, Wash.



Why this is the world's leading automatic oil-burner

A modern comfort with which you can provide any home. A lifetime of work-free, trouble-free heating satisfaction and economy

MORE than 27,000 American homes today enjoy the comfort and economy of NOKOL'S fully automatic heat—and *have* for periods up to seven years. In number of users, as in proved efficiency, it is the world's leading automatic oil-burner. And today homes *without* gas can enjoy it as well as homes having gas. Small homes as well as large homes.

Provides New Comfort

The proper fuel is properly burned by NOKOL, to give two results every home owner wants: 1) Constant, even temperatures automatically maintained—without work or attention, without trouble or interruption; and 2) real economy in the cost of a season's heat. Definitely proved by NOKOL'S record.

Founders of the industry, leaders ever since, NOKOL makers have now perfected *positive, trouble-free electric ignition,* for homes where gas is not available.

It provides, *for the first time* with electric ignition, *positive, complete combustion* within a matter of seconds.

Facts You Can Use

There is detailed information on this important question which should be in the hands of every architect, engineer, builder, heating contractor, for reference when clients ask. No space for it here. But it will be sent promptly upon request. Address: AMERICAN NOKOL CO. 215 No. Michigan Avenue, Chicago, Illinois

NO COAL
NOKOL
Automatic Oil Heating for Homes

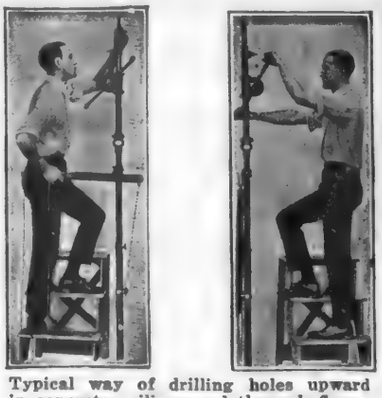
Tested and Listed as Standard by the Underwriters' Laboratories and approved by all principal Safety Boards

Manufactured and guaranteed by
AMERICAN NOKOL COMPANY, *Chicago*

PHILLIPS SPRING HAMMER DRILLS

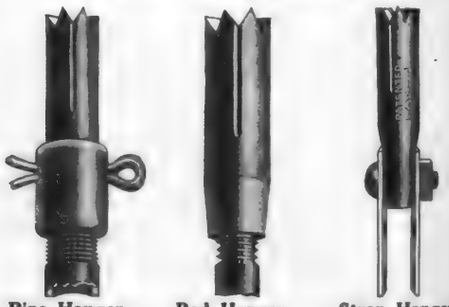
The most satisfactory and economical tool for drilling Upward Holes in concrete ceilings and through floors. Recommended to all contractors and industrial plants.

Phillips Spring Hammer Drills are used almost exclusively by the Automatic Sprinkler Companies, *World's Biggest Drillers of Up Holes in Concrete.*



Typical way of drilling holes upward in concrete ceilings and through floors. Also installing Self-Drilling Expansion Bolts.

PHILLIPS Self-Drilling Expansion Bolts



Pipe Hanger Shell — Rod Hanger Shell — Strap Hanger Shell

For fastening pipe and other hangers and apparatus to concrete ceilings, walls or floors. Every shell drills its own hole, saving time and labor in installing. Makes own hole, then enlarges it at the bottom and is expanded hard and tight in the enlarged hole. Quickly installed with Spring Hammer, air or electric hammers, or by hand.

PHILLIPS DRILL COMPANY
1537 Cortland Street
CHICAGO, ILLINOIS

RAYFIELD

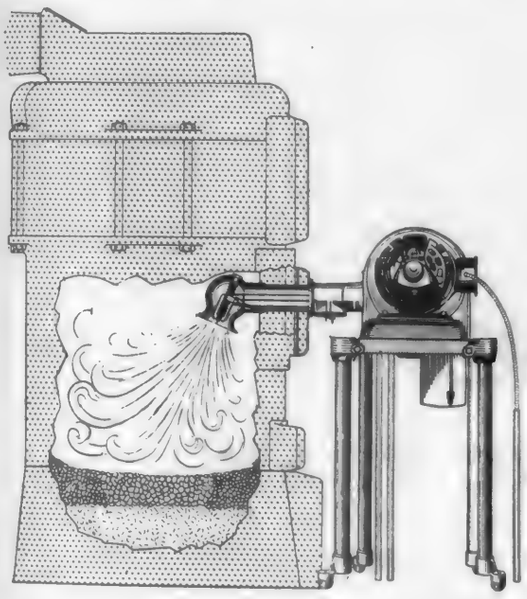
PATENTS PENDING

Automatic Fuel Oil Burner

wins the approval of

Heating Engineers *and* Heating Plant Manufacturers

The Rayfield is a Super-system of heating designed and perfected by Chas. L. Rayfield, inventor of the well-known Rayfield Carburetor for automobiles, and an acknowledged authority on the combustion of liquid fuels.



for the simple reason that the Rayfield carries out the practical operating principles found in the standard types of heating plants now in use.

In heating boilers and furnaces designed to burn coal the application of the maximum heat is at the bottom of the fire box. There is also a bed of coals to radiate heat during the periods of low fire.

These are sound, well established engineering principles, and it is obvious that an oil burner must meet these conditions in order to produce the best results. Both of these principles are incorporated in the Rayfield Automatic Fuel Oil Burner and it is the only domestic oil burner that fully utilizes the Radiant Heat principle.

Rayfield's Scientific Combustion

Note the illustration. The nozzle is suspended over the fire pot. The vapor, burning in suspension, is forced directly downward to the crushed fire brick at the bottom, then deflected to the sides and rises evenly along the walls of the fire box before the generated heat escapes through the flue. In this manner the flame travels twice the usual distance in the fire box, giving off the maximum heat at the bottom of the fire box and completing combustion before reaching the flue.

The Radiant Heat principle is utilized through the bed of crushed fire brick placed in the ash pit. In operation this brick quickly becomes incandescent, absorbing and saving the heat that would otherwise be lost up the chimney. Long after the burner has been shut off by the thermostat, this white-hot bed of crushed brick continues to radiate its stored heat and thus assists in maintaining an even temperature throughout the building.

For Steam, Vapor, Hot Water, Hot Air

The Rayfield is fully automatic and operates successfully in any good heating plant. It comes in various sizes and has had three years of practical tests in homes, apartments, theatres and factories.

You have been waiting a long time for this scientific oil burner—a burner that you would readily install in your own home after seeing a demonstration.

Send for illustrated circular

Rayfield Mfg. Co.

21st and Rockwell Sts. CHICAGO

Rayfield Burns 28°-30° Fuel Oil

This grade of Fuel Oil is lower in cost and higher in heat units than the lighter oils. We burn it as clean as illuminating gas—no smoke, no carbon, no residue and no odor. The Rayfield can burn the lighter oils but they are not so economical.

4 Exclusive Features

that make the Rayfield Supreme

1. Utilizes the Radiant Heat Principle.
2. Perfected Electric Ignition.
3. Air-cooled, Non-carbonizing Nozzle.
4. Triple Atomization.

Our Facilities and Organization

Our large plant is equipped with foundry, modern machinery, testing and assembly departments—everything necessary for economical and quantity production.

The same organization that produced the well-known Rayfield Carburetor is behind the Rayfield Oil Burner. Our reputation and responsibility are too well known to require further comment.

Contractor-Dealers Wanted

The Rayfield franchise will appeal to men who know the heating business. A profitable connection is offered responsible parties who are prepared to demonstrate, sell and install our equipment. Write for territory and further particulars.

THERMOSTATIC TRAP

Conceived, designed and built to a purpose — the elimination of trap troubles — the ***Milvaco Thermostatic Trap*** embodies in its detail of construction, principal of operation, and accomplishment of purpose, a standard synonymous to the Milwaukee Valve Company.

Backed by twenty-five years of manufacturing experience —A message with a meaning to the discriminating buyer.

Bulletin No. 23 descriptive in detail of the Milvaco Thermostatic Trap will gladly be mailed you upon request.

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN, U. S. A.

Safety—Comfort—Satisfaction are Guaranteed

with **Aetna** TRADE-MARK

AUTOMATIC OIL BURNERS

Nine years of satisfactory service in heating all types and sizes of buildings has proven the AETNA to be a safe, simple, reliable and economical Oil Burner which can be profitably installed wherever quick and automatic heating is required.

Four exclusive and positive safety devices eliminate all possibility of accident, while automatic regulation of fuel and lubrication permit the AETNA to be operated without either attention or adjustment beyond keeping water in the boiler and oil in the storage tank.

Made In Six Different Sizes

AETNA AUTOMATIC OIL BURNER, Inc.

Georgia Avenue **PROVIDENCE, R. I.**

Six sizes of burners, with capacities ranging from 500 sq. ft. to 20,000 sq. ft. direct steam radiation. (Fuel consumption ½—60 gal. per hour.)

Listed by Underwriters Laboratories, approved by the New York Board of Standards and Appeals and by all Insurance and Municipal Authorities wherever installed.

Adapted for Steam, Hot Water and particularly Warm Air Furnaces.

Local distribution since 1916.
Now ready for national distribution.
Highest grade, lowest priced burner on the market.

Aetna Dealers Sales with unlimited range of field allowed by six Aetna sizes, realize profits not possible with any other oil burner.

Aetna burners are operating on oil fuels from 26 deg. A.P.I. to 45 deg. A.P.I.

Write for Dealers' Plan

AETNA AUTOMATIC OIL BURNER, Inc.
Georgia Ave., Providence, R. I.

Gentlemen:

Please send me full particulars regarding the AETNA Dealers' Plan.

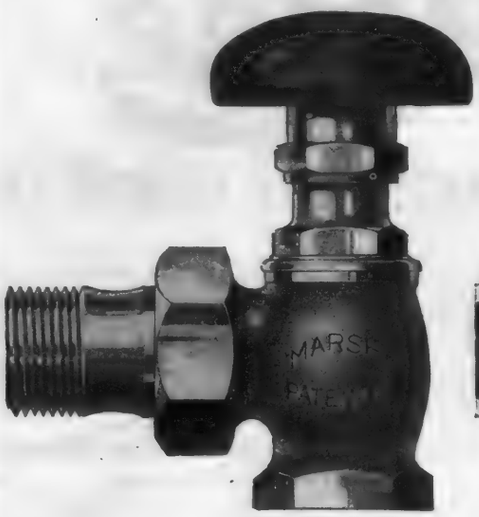
Name.....

Street.....

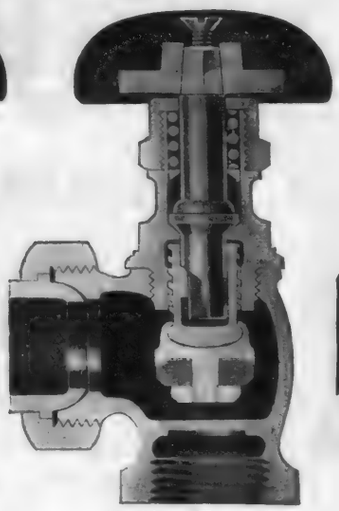
City..... State.....

A-2

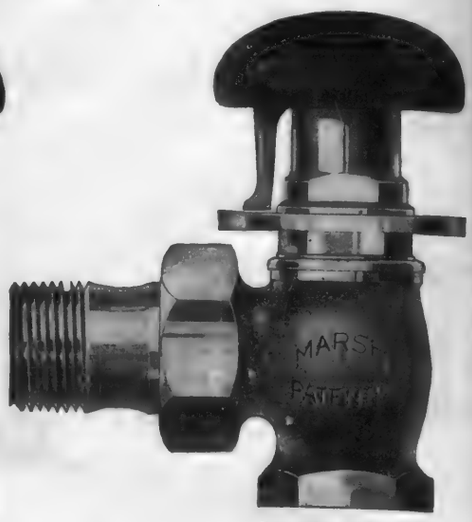
Marsh Cone Discs are without question the **greatest improvement** in radiator valve construction **in the past fifty years** or since the composition disc replacing the old style metal-to-metal disc and seat



Cone Disc Packless
Fig. 141

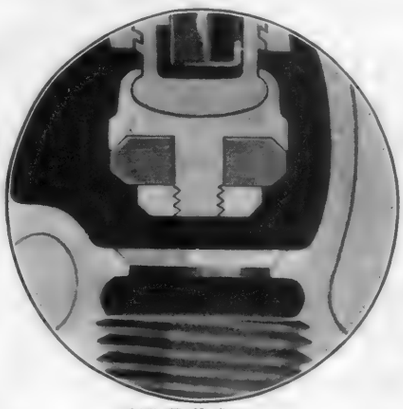


Packless Feature



Cone Disc Modulated
Fig. 147

This Cone Disc construction combined with the **Marsh Re-enforced Packless Feature** is the last word in completing radiator valve **maximum efficiency** at **popular prices,** all of which will check 100% true upon investigation.

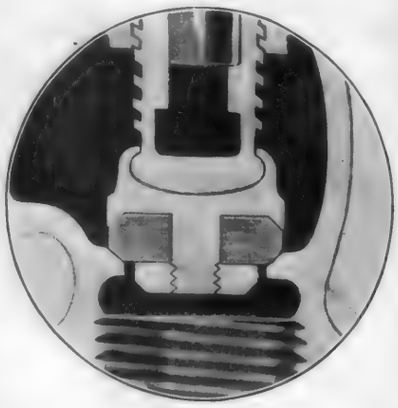


¾" Full Size

¾" Cone Disc

These Discs will not crack or leak through valve seat.

No clogging or water hammer from return condensation.



Positive Seal

The above views showing cone disc and beveled seat are to **actual size of a ¾" valve** and are made to full size to show the following advantages of this construction over the old style flat disc and seat:

FIRST: Through design of disc and protection afforded from disc nut covering under surface they will not warp and crack as will a flat disc which overhangs valve seat.

SECOND: The compression is at right angles to face of seat, forcing disc compound inward to center, making disc more compact and harder instead of scoring and extruding over seat, opening cracks or seams if any, as with a flat disc.

THIRD. While the life of these cone discs because of construction, as proven by tests, is three to five times the life of a flat disc, and a CRACKED DISC IS IMPOSSIBLE, the matter of exchange if desired is very simple, as to remove disc nut the disc will drop from dischholder, while with a flat disc it must be dug out, often destroying dischholder. Further, these cone discs are reversible and can be turned over or replaced with new at the same cost as for a flat disc.

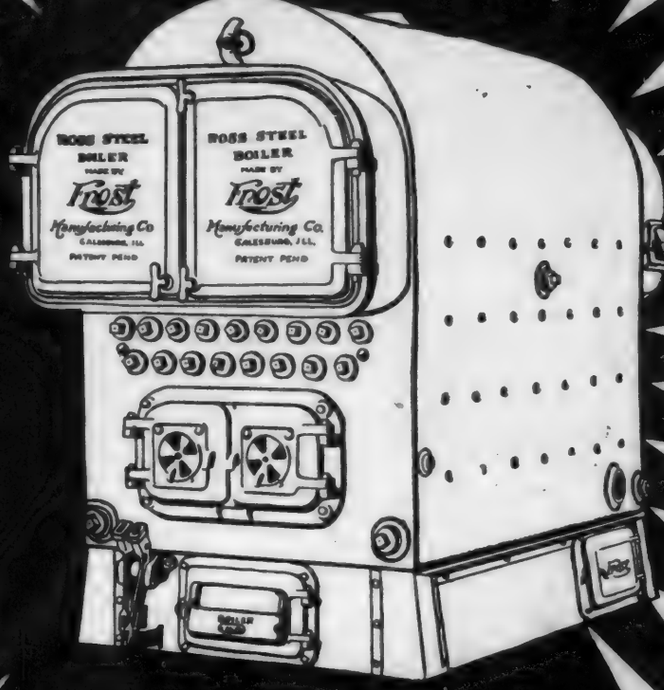
FOURTH: The beveled seat is low in valve body, giving perfect drainage and will wash free from sand or scale in system, positively providing against leakage through scale or grit imbedding in disc AS IS COMMON with a raised flat seat and flat disc construction.

FIFTH: Through this low beveled seat, to return condensation through valve for a one-pipe system, the flow will hold to the outer wall leaving center of valve throat and pipe free rather than shoot out over a raised seat to the center of pipe as is common with a heavy flow over a flat seat, clogging flow of steam, causing hammer or pounding of system.

The above are all, each and every one, practical points which will prove out in test and practice. Positively a better valve at a less cost than can be had from any other source.

MARSH VALVE COMPANY - - Dunkirk, N. Y.

Cock O' the Walk



SMOKELESS RED BRICK
STEEL HEATING BOILERS

EASY TO INSTALL
REQUIRES NO BRICKWORK
LONG FIRING PERIODS
SAVES COAL
EASY TO CLEAN

Made in Sizes Small Enough for the Tiniest Bungalow to Those Large Enough for the Impressive Skyscraper

WRITE FOR CATALOGUE

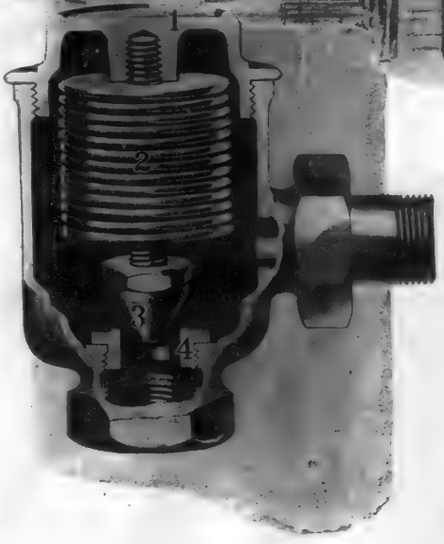
The Frost Manufacturing Co.

Main Office and Works
Galesburg, Ill.

75 YEARS OF QUALITY BUILDING

Chicago Sales Office
112 West Adams St.

H. H. the Crown Prince's Palace at Akasaka, Japan



No. 1—Body and Cover of Multiflex Return Trap are heavy brass castings, metal-to-metal joints.

No. 2—Thermal Member is seamless one-piece Multiflex metal bellows.

No. 3—Conical Valve always insures positive seating. Made of the best steam brass.

No. 4—Brass Seat has sharp edge, prevents accumulation of dirt and scale. Seat is renewable.

Each individual trap is tested and adjusted accurately and permanently at the factory.

Abroad as Well as at Home

Bishop & Babcock Heating Specialties are installed in many of the finest buildings. Selection of equipment by exacting tests for efficient performance has resulted in the adoption of Bishop & Babcock Heating Specialties in buildings of this character.

Products bearing the trade name "Multiflex" are a safe guide in buying for palace, skyscraper, factory or dwelling.

Bishop & Babcock Multiflex Traps, as illustrated, are used in the return end of radiators, coils, and vento heaters, on drip points, for draining mains.

Other prominent installations in Japan of "Multiflex" Traps include the

Imperial Household
Imperial University
Gifu Prefectural Government
Hokkaido Imperial University
Tohoku Imperial University
Tokyo Imperial University
Japan Red Cross Society, Wakayama Branch
Tokyo High School
Nagasaki Medical College
Tokyo Music Academy
Kansai Hospital
Saito Factory
Fujita Gumi
Bunka Kogyosha
Okayama Medical College
Mitsubishi Internal Combustion Engine Co.

Let us mail you our latest Hand Book especially prepared for architects and engineers.

THE BISHOP & BABCOCK SALES CO.
General Offices Cleveland, Ohio
Offices in Principal Cities

BISHOP & BABCOCK
HEATING SPECIALTIES

No Corrosion Problems Here

The illustration above reproduces the center spread from our bulletin entitled, "Water—But No Corrosion." It shows a few of the buildings and institutions which have permanently protected their water lines by means of an Elliott Deaerator or Deactivator installation.

By removing the dissolved oxygen and other gases from the water, these units definitely overcome corrosion in piping. They protect the piping investment and eliminate unpleasant and expensive experiences with rusty water, stained fixtures, bursting pipe lines, and their after effects.

We'll Send the Bulletin and Particulars Upon Request.

ELLIOTT COMPANY

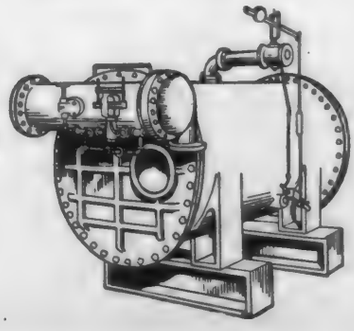
Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

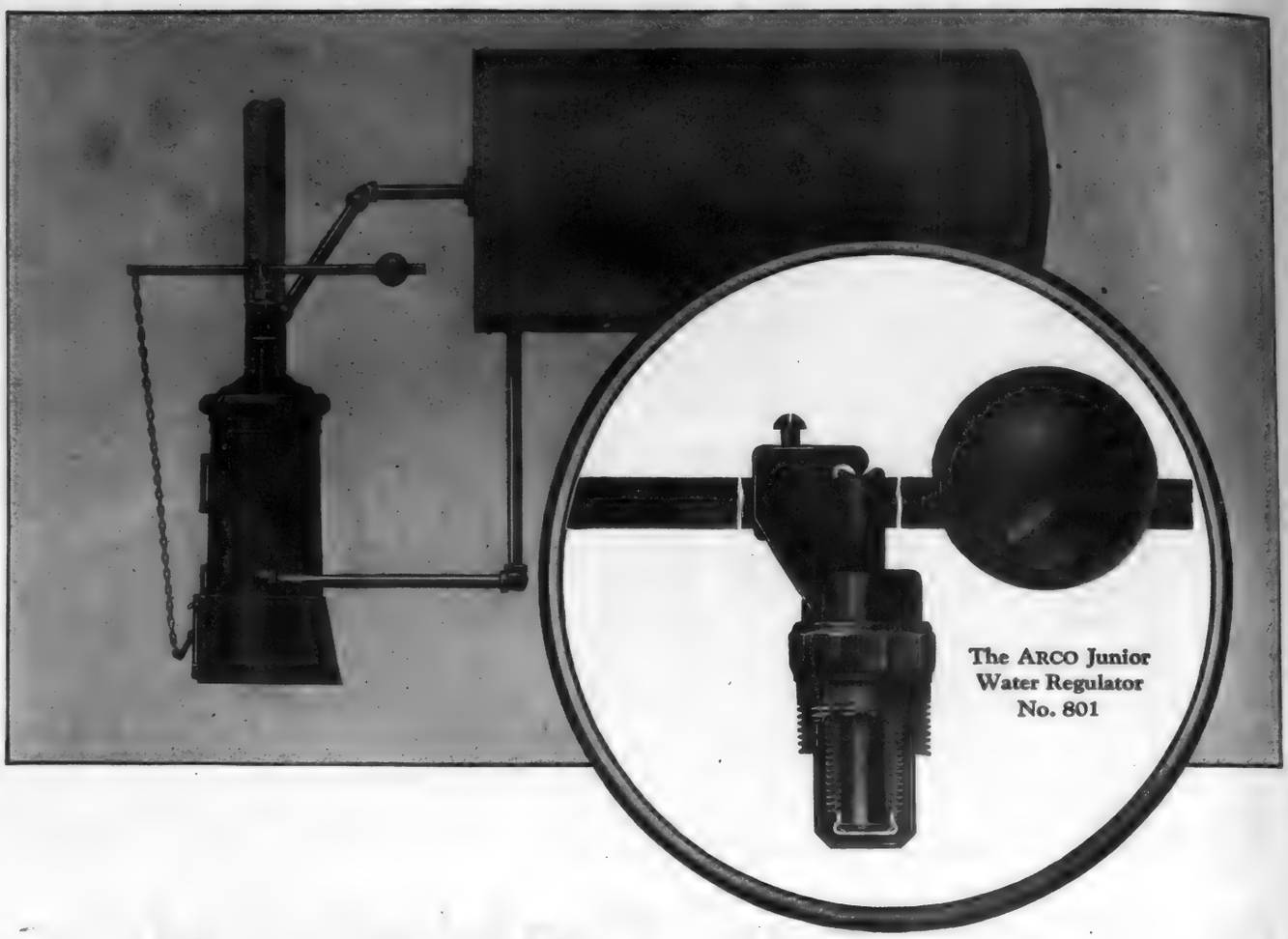
District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh and St. Louis

N-834

De-oxygen-ating Deactivators



Apparatus Deaerators



Are we all overlooking a bet?

HAVE you ever operated a tank heater? Then you know that no tank heater should be installed without some means to control combustion.

The Arco Junior Regulator is made for just this purpose—no other. It masters the problem—at a cost that is a mere trifle—

by keeping the fire going sweetly and saving the curse of rekindling—by holding the temperature just where it is wanted, and by preventing the chance of boiling.

Three minutes' conversation will sell an Arco Junior Regulator to almost any owner—and he'll thank you for your service besides.

It won't cost anything to try this for one month: *Every time you sell a tank heater, mention the Arco Junior Water Regulator.*

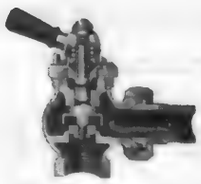
AMERICAN RADIATOR COMPANY

IDEAL Boilers, AMERICAN Radiators, ARCO Valves and Regulators

1807 Elmwood Avenue Dept. S Buffalo, N. Y.

Messrs. *Mehring and Hansen* were heating contractors for the residences illustrated

Your Client's Comfort



The Webster Type "W" Modulation Valve

Used with the Webster Modulation System of Steam Heating to provide *complete* control of each radiator, keeping the radiator one-quarter or one-half filled—as desired.

Visit our booth (225-226) at the Fourth National Exposition of Power & Mechanical Engineering, Grand Central Palace, New York, November 30, —December 5, 1925.

COMFORT—with economy—is the goal of modern heating. And it was obtained by Messrs. Mehring and Hansen, heating contractors for the three beautiful Minneapolis homes pictured above, by installing a Webster Modulation System of Steam Heating in each residence. Continued comfort thru eight Minnesota winters has proved the worth of these contractors' work.

The fact is that a ***substantial percentage*** of America's finest homes (those costing over $50,000) are heated by Webster Systems . . . installed almost invariably on the recommendation of the heating engineer or architect.

One—of many—reasons for this preference is the advantage of ***modulation control,*** described briefly at the left . . . Let us show you how a Webster System will add prestige to ***your*** work on your next fine residence job.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

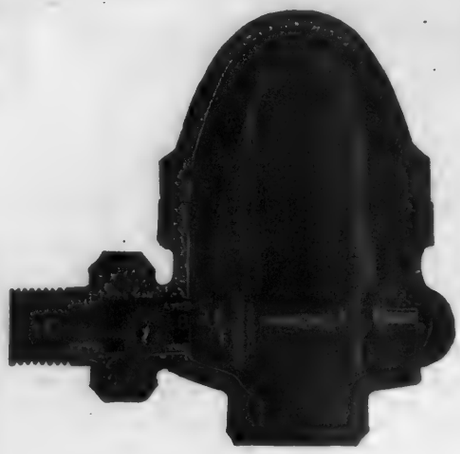
Camden, N. J. **50 Branch Offices**

In Canada, Darling Bros., Ltd., Montreal

- since 1888

Webster Systems of Steam Heating

More than 34,000 installations in America's finer buildings



"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

Send for booklet

WILLIAM S. HAINES & CO.

12th & Buttonwood Streets

PHILADELPHIA, - - PA.

VENTO

The Mouat System of Heating Operates on 1 to 2 oz. Pressure

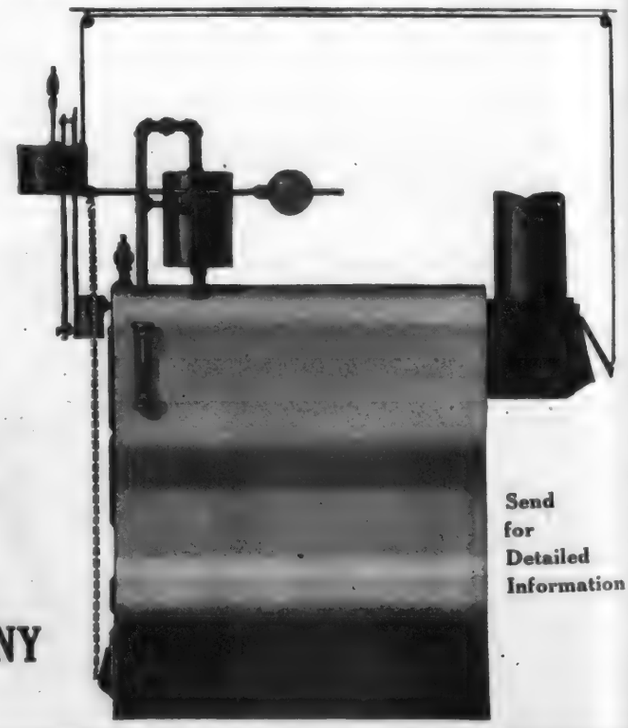
How Pressure is Maintained

The Mouat System of Heating, a two-pipe gravity vapor or atmospheric steam heating system, operates at from 1 to 2 ounces pressure. No pumps, thermostatic valves, return traps or mechanically operated parts.

This extremely low pressure is maintained by the Mouat Damper Regulator, sufficiently sensitive to operate at a variation of less than one ounce. This regulator is not affected by high, low, or unsteady waterline, since the working parts are connected above the waterline of the boiler. No water can be forced out of the boiler through the regulator.

This regulator can also be used to reduce steam pressure to vapor pressure on central station heating plants.

The accompanying illustration shows a typical installation of a Mouat Damper Regulator.



Send for Detailed Information

MOUAT VAPOR HEATING COMPANY

CLEVELAND, OHIO

EARLE THEATRE BLDG., WASHINGTON, D. C.
Isadore Freund, Contractor

IN no other type of building are the heating requirements more exacting than in theatres. The use of ILLINOIS HEATING SYSTEMS insures a standard uniform temperature which may be easily and instantly controlled. In addition to these features, durability, economy and satisfactory operation are assured by more than 25 years of experience in the manufacture of quality heating products.

Bulletin #21 will be promptly sent on request; it contains a set of standards for computing radiation and boiler sizes in addition to other information.

Consult telephone directory for address of local office

ILLINOIS

PRODUCTS

Radiator Traps
Modulating Valves
Return Traps
Pressure Reducing Valves
Heat Retainors
High and Low Pressure Steam Traps
Blast Traps
Separators *—oil and steam*
Back Pressure Valves
Expansion Joints

REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

Sterlco
TRADE MARK

THOUSANDS of apartments in buildings such as the above are being heated to the satisfaction of discriminating tenants with Sterlco Heating Service. Years have been devoted to the development of this service to its present state of perfection.

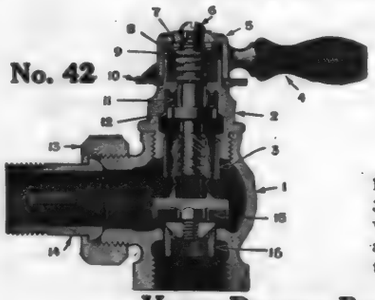
Bulletins No. 36 and 38 describe Sterlco Products and Sterlco Service

STERLING ENGINEERING COMPANY

1626-44 Holton Street, Milwaukee, Wis.

THERE IS A STERLCO REPRESENTATIVE IN YOUR LOCALITY

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



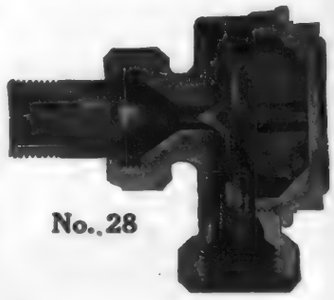
No. 42

Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



No. 28

Vapor Damper Regulators

No. 58

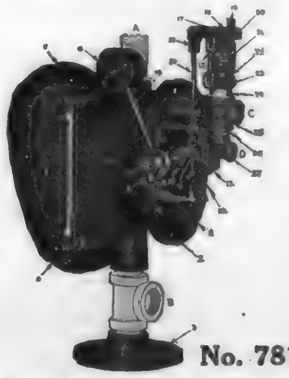
All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.

No. 15



No. 781

Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

THE McALEAR MFG. CO.

1901-7 S. Western Ave.

CHICAGO, ILL.

Between the Periods These Two Gentlemen Represent - Is An Epoch of Amazing Mechanical Progress

In a period of less than a century amazing mechanical progress has been made. The perfection of the automobile and aeroplane, the development of the radio and submarine, and many other inventions have been created and improved to a point where they contribute greatly to man's daily comfort, convenience and pleasure.

So, too, with Air Washers—machinery for ridding the air of solids and suspended impurities. First the saturated cloth screen, then the bank of spray nozzles through which water was forced at high pressure to produce a fine spray, and finally the Turbo Air Washer,—the most efficient air washing apparatus available today!

The Turbo Air Washer is based on the Bayley Turbo-Atomizer, consisting of a single fire type nozzle, which delivers the water to a spray wheel or rotor where it is whirled centrifugally through the atomizing pins, forming a dense even curtain of water through which no impurities pass. Its outstanding advantages in comparison with previous apparatus for washing air, are that it will not clog and that it requires only nominal water pressure for successful operation. The Turbo Air Washer operates at a water pressure of from 75 to 90% lower than high pressure systems which require a pressure of from 20 to 30 lbs. per square inch, as a result it saves from 40 to 60% of the power required to operate such systems.

Let us send you Illustrated Bulletin No. 25, giving the complete facts on the Bayley Turbo Air Washer

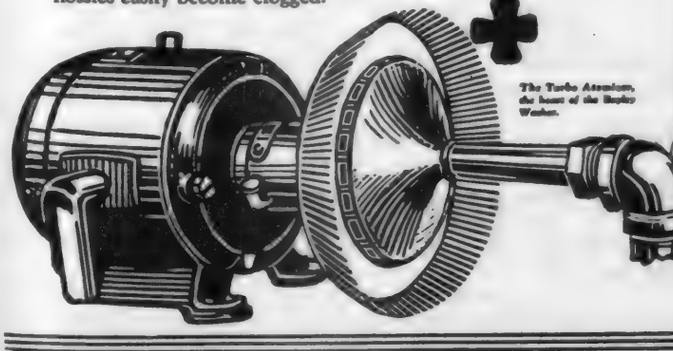
BAYLEY MANUFACTURING COMPANY, 742 Greenbush St., Milwaukee, Wis.

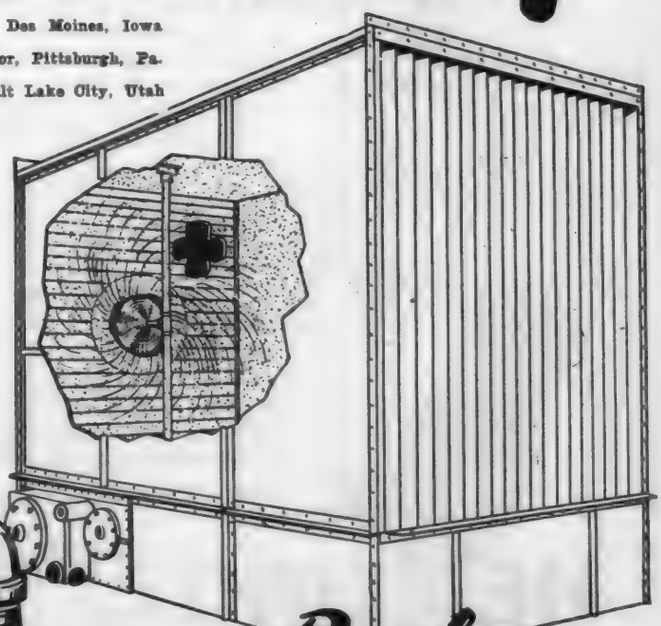
BRANCH OFFICES:

1156—1st Nat'l B'k., Chicago, Ill.
523—Penton Bldg., Cleveland, Ohio
Purcell Stone Co.,
2347—Grand River Ave., Detroit, Mich.
1926—Railway Exchange Bldg., St. Louis, Mo.
425—Board of Trade Bldg., Indianapolis, Ind.
403—Observatory Bldg., Des Moines, Iowa
Leidendecker Bros.,
Fulton Bldg., 2nd Floor, Pittsburgh, Pa.
P. W. Belcher,
Dooly Block, Salt Lake City, Utah
Geo. H. Jerge.

Will Not Clog

The Bayley Turbo Air Washer will not clog, needs no pump screen, and requires only nominal water pressure. It churns the water centrifugally into a dense even spray. The high pressure, multiple nozzle air washer requires water at high pressure, screened at the pump, and the fine orifice nozzles easily become clogged.


The Turbo Atomizer, the heart of the Bayley Washer.



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MEDICAL ARTS BUILDING
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YELLOWSTONE PARK TRANSPORTATION CO.
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Raleigh, N. C. 222

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(...continued)

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That's all there is to the SIGNAL. But that is all you want; it's all you ***need.*** A low temperature radiator is ***mighty easy to find.***

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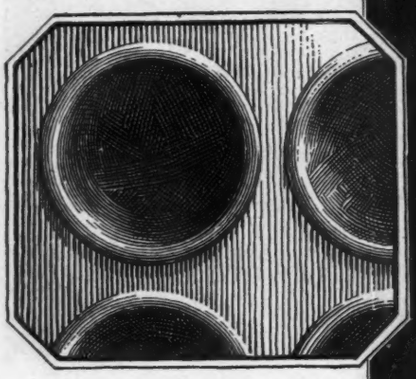
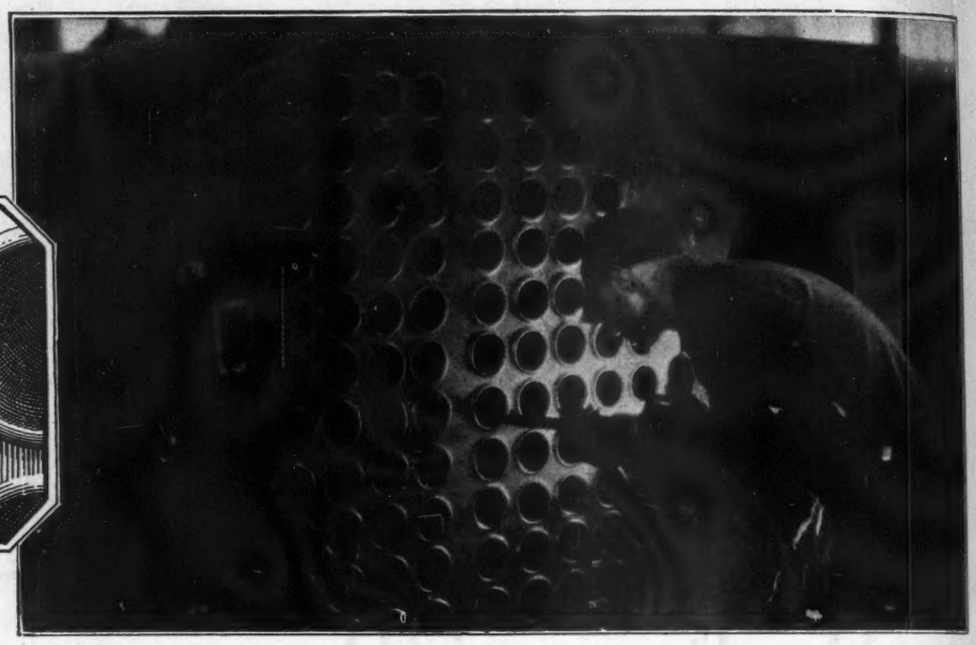


Expanding and beading make tubes water-tight.



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The Heating and Ventilating Magazine

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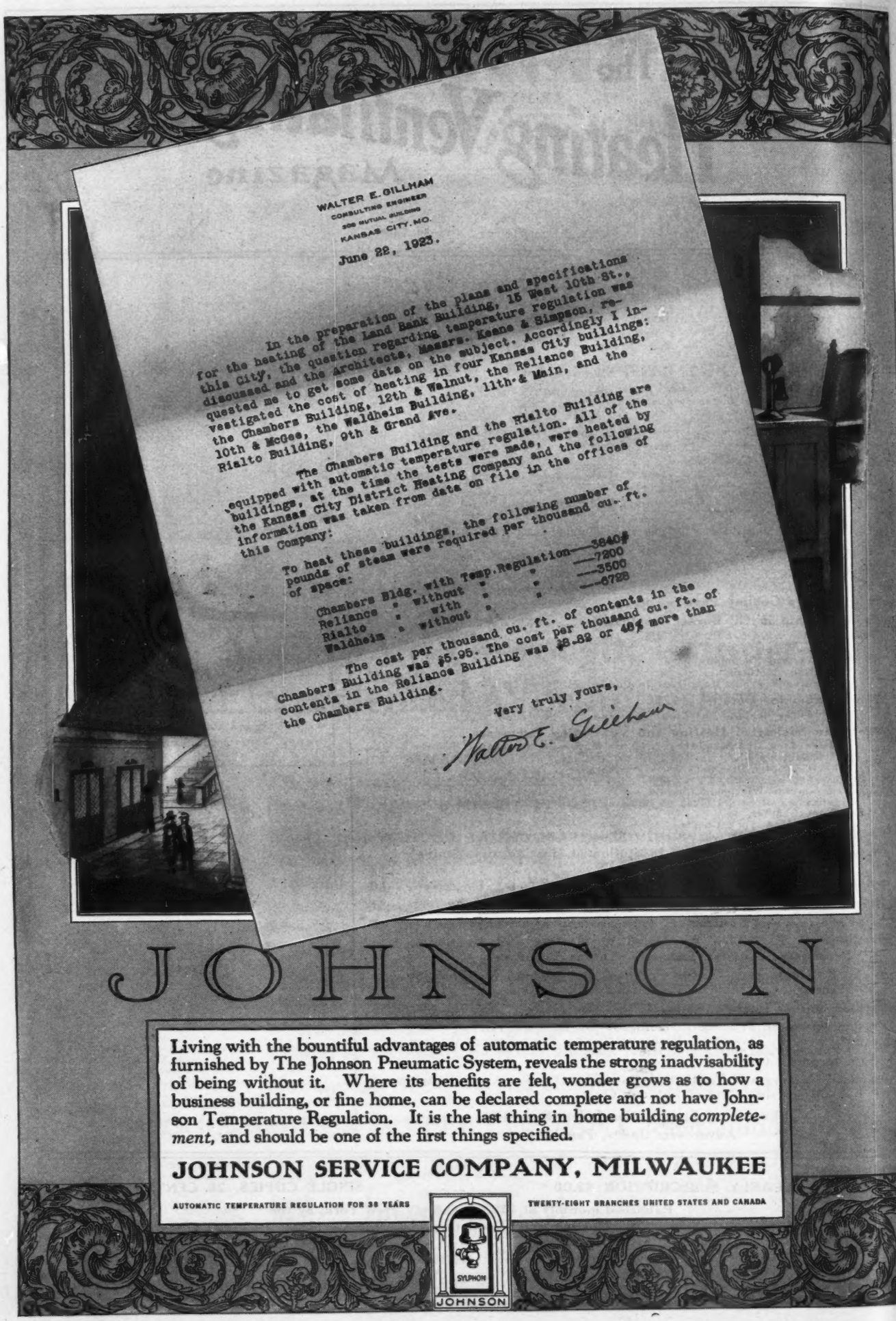
WALTER E. GILLHAM
CONSULTING ENGINEER
306 MUTUAL BUILDING
KANSAS CITY, MO.
June 22, 1923.
In the preparation of the plans and specifications for the heating of the Land Bank Building, 15 West 10th St., this City, the question regarding temperature regulation was discussed and the Architects, Messrs. Keane & Simpson, requested me to get some data on the subject. Accordingly I investigated the cost of heating in four Kansas City buildings: the Chambers Building, 12th & Walnut, the Reliance Building, 10th & McGee, the Waldheim Building, 11th & Main, and the Rialto Building, 9th & Grand Ave.
The Chambers Building and the Rialto Building are equipped with automatic temperature regulation. All of the buildings, at the time the tests were made, were heated by the Kansas City District Heating Company and the following information was taken from data on file in the offices of this Company:
To heat these buildings, the following number of pounds of steam were required per thousand cu. ft. of space:
Chambers Bldg. with Temp. Regulation—3840#
Reliance " without " " —7200
Rialto " with " " —3500
Waldheim " without " " —6728
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